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181 c.133

A KEY TO ARITHMETIC FOR SCHOOLS.

Cambridge:
PRINTED BY METCALFE AND PALMER,

FOR MACMILLAN & Co., CAMBRIDGE.

London: BELL & DALDY, 186, Fleet Street.
Oxford: J. H. & JAS. PARKER.
Edinburgh: EDMONDSTON & DOUGLAS.
Glasgow: JAMES MACLEHOSE.
Dublin: WILLIAM ROBERTSON.

A KEY

TO

ARITHMETIC FOR SCHOOLS.

BY

BARNARD SMITH, M.A.,

FELLOW OF ST. PETER'S COLLEGE, CAMBRIDGE.

BIBLIOTHECA BODLEIANA

Cambridge:
MACMILLAN AND CO.
1856.

181. C. 133.

PREFACE.

As the Rule given for the Inverse Rule of Three in the *Arithmetic*, appears to be thought by some School-masters difficult of application, the Author has been induced to adopt a new Rule, in accordance with the principles of which the Examples under the head of Double Rule of Three are worked out.

The Author begs to return his best thanks to Mr. J. H. Smith, M.A., of Caius College, who has kindly taken the entire charge of the work during its progress through the Press.

St. Peter's College, [illegible]
[illegible]

PREFACE.

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St. Peter's College, Cambridge,
Jan. 19, 1856.

SOLUTIONS, &c.

NOTATION.

Ex. I., (p. 3.)

1. 63; 81; 99; 40; 13.
2. 200; 303; 764; 888.
3. 4000; 1471; 6930; 9009.
4. 27504; 33000; 9016.
5. 100000; 676050; 202593.
6. 7003000; 11108106; 54054088; 613020303.
7. 2000000000000; 9000000300021; 94000090094904.

NUMERATION.

1. Forty-three; sixty; eighty-eight; ninety-seven; fifty-nine; twelve; twenty-one; nineteen.

2. Two hundred and fifty-six; four hundred and one; five hundred; nine hundred and ninety-nine; three hundred and sixty-five; five hundred and seventy-eight; eight hundred and thirty-seven.

3. Two thousand; one thousand, seven hundred and twenty-four; three thousand and three; seven thousand, five hundred and eighty-four; one thousand and seventy-five; four thousand, five hundred and forty-one.

4. Thirty-seven thousand and three; forty-seven thousand and forty-nine; sixty three thousand and ninety; eighty thousand and eight; three hundred and forty-one thousand, three hundred and twenty-three.

5. Six millions, eight hundred and fifty thousand, four hundred and six; eight millions, eighty thousand, eight hundred and eight; seven millions, eight hundred and forty-nine thousand, six hundred and thirty; four hundred and eighteen thousand, two hundred and fifty-four.

6. Ten millions and one; twenty millions, two hundred and twenty thousand and twenty-two; ninety-two millions, five hundred and sixty-eight thousand, nine hundred and eighty-seven; thirty millions, one hundred and eighty thousand and seventy.

7. Two thousand five hundred and sixty millions, five hundred and thirty thousand, two hundred; eight hundred millions, three hundred and nine thousand, five hundred and sixty; nine thousand seven hundred and thirty-eight millions, four hundred and thirteen thousand, two hundred and eight.

8. Seven thousand and seventy millions, four hundred and twenty-three; nine hundred and eighty-seven millions, six hundred and fifty-four thousand, three hundred and twenty-one; five thousand seven hundred and seven millions, sixty-eight thousand and eighty.

9. One hundred billions, one hundred and ninety-eight thousand seven hundred millions, ten thousand and ninety; forty-eight thousand seven hundred and twenty-six billions, eight hundred and seventy thousand six hundred and thirty-four millions, one hundred and three thousand, two hundred and sixty-four.

SIMPLE ADDITION.

Ex. II., (p. 6.)

2. 252. 4. 2288. 5. 2073. 6. 12854. 8. 15997. 9. 19258.
10. 112040. 11. 11001543. 13. 3611911. 14. 1148390.
15. 2923038. 16. 1881390. 17. 14547; 48829; 82391.
18. 779264; 2925620. 19. 149036957938; 16696683926; 142228910945.
20. 98929. 21. 4304268. 22. 1002733636293.

SIMPLE SUBTRACTION.

Ex. III., (p. 10.)

2. 445. 3. 221. 4. 86. 5. 1147. 6. 41830.
7. 17359. 8. 432099. 9. 899899. 10. 300368384.
11. 73646889. 12. 6130908; 7036970; 111232112.
13. 115849491; 2922930923; 568990634342. 14. 8087; 4936.
15. 3999996; 99700000. 16. 14515927.

Ex. IV., (p. 11.)

1. XXX; XLVIII; LIX; CCXXII; $\overline{\text{VI}}$; M.DCCC.XLIII.

2. Twenty-three, 23; sixty-nine, 69; two hundred and eighteen, 218; five thousand and one, 5001; one hundred and fifty thousand, six hundred and three, 150603; two millions, one hundred, 2000100.

SIMPLE MULTIPLICATION.

Ex. V., (p. 16.)

2. 2019. 3. 14335. 4. 44952. 5. 14399.
6. 459272. 7. 24710742. 9. 395736. 10. 1098300.

(12)
$$\begin{array}{r} 96843 \\ 17 \\ \hline 677901 \\ 96843 \\ \hline 1646331 \end{array}$$

(13)
$$\begin{array}{r} 87298 \\ 46 \\ \hline 523788 \\ 349192 \\ \hline 4015708 \end{array}$$

(14)
$$\begin{array}{r} 16097 \\ 59 \\ \hline 144873 \\ 80485 \\ \hline 949723 \end{array}$$

(15)
$$\begin{array}{r} 296897 \\ 83 \\ \hline 890691 \\ 2375176 \\ \hline 24642451 \end{array}$$

(17) 840607
80
67248560

(18) 175
189
1575
1400
175
33075

(19) 6298
769
56682
37788
44086
4843162

(21) 25607
5004
102428
128035
128137428

(22) 78847
8803
236541
630776
630776
694090141

(23) 234578
18
1876624
234578
4222404

234578
29
2111202
469156
6802762

234578
53
703734
1172890
12432634

924846
67
6473922
5549076
61964682

924846
95
4624230
8323614
87860370

924846
430
27745380
3699384
397683780

2846067
206
17076402
5692134
586289802

2846067
1008
22768536
2846067
2868835536

2846067
907
19922469
25614603
2581382769

8409631
21711
8409631
8409631
58867417
8409631
16819262
182581498641

8409631
7009
75686679
58867417
58943103679

8409631
8435
42048155
25228893
33638524
67277048
70935237485

8409631
7980
672770480
75686679
58867417
67108855380

(24) 1754
9306
10524
5262
15786
16322724

47506
4500
23753000
190024
213777000

149570
15790
13461300
104699
74785
14957
2361710300

554768
39314
2219072
554768
1664304
4992912
1664304
21810149152

815085
20048
6520680
3260340
1630170
16340824080

123456789
987654321
123456789
246913578
370370367
493827156
617283945
740740734
864197523
987654312
1111111101
121932631112635269

57298492692
700809050321
57298492692
114596985384
171895478076
286492463460
515686434228
458387941536
401089448844
40155302248305278754132

(25)
9487352
4731246
56924112
37949408
18974704
9487352
28462056
66411464
37949408
44886996200592

38015732
400700065
190078660
228094392
266110124
152062928
15232906283422580

574585614865
2837154309
5171270533785
1723756844595
2298342459460
2872928074325
574585614865
4022099304055
1723756844595
4596684918920
1149171229730
1630188053103649203285

4342760
599999
39084840
39084840
39084840
39084840
39084840
21713800
2605651657240

17376872
7399078
139014976
121638104
156391848
156391848
52130616
121638104
128572831324016

(26)
650090
3008
5200720
1950270
1955470720

76008765
9009009
684078885
684078885
684078885
684763647963885

(27)
12
17
84
12
204
19
1836
204
3876

3781
3782
7562
30248
26467
11343
14299742
3783
42899226
114397936
100098194
42899226
54095923986

6565
6786
39390
52520
45955
39390
44550090
9898
356400720
400950810
356400720
400950810
440956790820

(28)
20470
1030
614100
20470
21084100

2958
476
17748
20706
11832
1408008

SIMPLE DIVISION.

Ex. VI., (p. 23.)

(1) 2) 456
228

(2) 2) 90680
45340

(3) 2) 261070308
130535154

(4) 3) 6378
2126

(5) 3) 470850
156950

(6) 3) 385734
128578

(7) 4) 372096
93024

(8) 4) 47392488
11848122

(9) 5) 337625
67525

(10) 5) 9876540
1975308

(11) 6) 890106
148351

(12) 6) 3782046
630341

(13) 7) 623399
89057

(14) 7) 78432407
11204629 with rem. 4.

(15) 8) 164864
20608

(16) 8) 3812312
476539

(17) 9) 7869231
874359

(18) 9) 39237840
4359760

(19) 11) 407792
37072

(20) 11) 91875342
8352303 with rem. 9

(21) 12) 211632
17636

(22) 12) 43600391
3633365 with rem. 11

(23) 13) 404586 (31122
39
14
13
15
13
28
26
26
26

(24) 17) 786543318 (46267254
68
106
102
45
34
114
102
123
119
43
34
91
85
68
68

(25) 2,0) 123456,0
61728

(26) 18) 8224776 (456932
72
102
90
124
108
167
162
57
54
36
36

(27) 27) 14683059 (543817
135
118
108
103
81
220
216
45
27
189
189

(28) 44) 817286228 (18574687
44
377
352
252
220
328
308
206
176
302
264
382
352
308
308

(29) 59) 54906734 (930622
531
180
177
367
354
133
118
154
118
36

(30) 96) 6848734752 (71340987
672
128
96
327
288
393
384
947
864
835
768
672
672

(31) 87) 70865432 (814545
696
126
87
395
348
474
435
393
348
452
435
17

(32) 55) 649305745 (11805559
55
99
55
443
440
305
275
307
275
324
275
495
495

(33) 123) 28894545 (234915
246
429
369
604
492
1125
1107
184
123
615
615

(34) 615) 433418175 (704745
4305
2918
2460
4581
4305
2767
2460
3075
3075

(35) 189) 1674918 (8862
1512
1629
1512
1171
1134
378
378

(36) 779) 31884740 (40930
3116
7247
7011
2364
2337
270

(37) 907) 536819741 (591863
4535
8331
8163
1689
907
7827
7256
5714
5442
2721
2721

(38) 5016,0) 111111111111,1 (22151337
10032
10791
10032
7591
5016
25751
25080
6711
5016
16951
15048
19031
15048
39831
35112
47191

(39) 144,0) 823546080,0 (5719070
720
1035
1008
274
144
1306
1296
1008
1008

(40) 7575) 57380625 (7575
53025
43556
37875
56812
53025
37875
37875

(41)
```
5406) 353008972662 (65299477
      32436
       28648
       27030
        16189
        10812
         53777
         48654
          51232
          48654
           25786
           21624
            41626
            37842
             37842
             37842
```

(42)
```
2468) 599961567212 (243096259
      4936
      10636
       9872
        7641
        7404
         23756
         22212
          15447
          14808
            6392
            4936
           14561
           12340
            22212
            22212
```

(43)
```
789,0000) 2679953,4687 (3396
          2367
           3129
           2367
            7625
            7101
             5243
             4734
             5094687
```

(44)
```
3851) 57111104051 (14830201
      3851
      18601
      15404
       31971
       30808
        11630
        11553
          7740
          7702
           3851
           3851
```

(45)
```
1111) 10000000000000000 (9000900090009
       9999
          10000
           9999
              10000
               9999
                  10000
                   9999
                      1
```

```
11111) 10000000000000000 (900009000090
        99999
           100000
            99999
                100000
                 99999
                    10
```

(46) 1646,00) 6343945,67 (3854
4938
14059
13168
8914
8230
6845
6584
26167

(47) 90009) 67157148372 (746115
630063
415084
360036
550488
540054
104343
90009
143347
90009
533382
450045
83337

(48) 200563) 1220225292 (6084
1203378
1684729
1604504
802252
802252

(49) 8496427) 7428927415293 (874359
67971416
63178581
59474989
37035925
33985708
30502172
25489281
50128919
42482135
76467843
76467843

(50) 79094451) 60435674536845 (764095
553661157
506955883
474566706
323691776
316377804
751397284
711850059
395472255
395472255

```
(51) 5578) 65358547823 (11717201
           5578
           ----
            9578
            5578
            ----
            40005
            39046
            -----
              9594
              5578
              ----
              40167
              39046
              -----
               11218
               11156
               -----
                  6223
                  5578
                  ----
                   645
                   ---
```

```
(52) 687637943) 3968901531620 (5771
                3438189715
                ----------
                 5307118166
                 4813465601
                 ----------
                  4936525652
                  4813465601
                  ----------
                   1230600510
                    687637943
                   ----------
                    542962567
                    ---------
```

```
(53) 3854) 152181255 (39486
           11562
           -----
            36561
            34686
            -----
             18752
             15416
             -----
              33365
              30832
              -----
               25335
               23124
               -----
                2211
                ----
```

```
(54) 4093) 143255 (35
           12279
           -----
            20465
            20465
            -----
```

```
(55) 72) 203534191 (2826863
         144
         ---
          595
          576
          ---
           193
           144
           ---
            494
            432
            ---
             621
             576
             ---
              459
              432
              ---
               271
               216
               ---
                55
                --
```

```
72 { 8 | 203534191—7 }
   { 9 |  25441773—6 } 55
       |  2826863, with rem. 55.
```

GREATEST COMMON MEASURE.

Ex. VII. (p. 26.)

```
1. (1) 16) 72 (4
           64
            8) 16 (2
               16
∴ 8 is G. C. M.
```

```
(2)  30) 75 (2
         60
         15) 30 (2
             30
∴ 15 is G.C.M.
```

```
(3)  63) 99 (1
         63
         36) 63 (1
             36
             27) 36 (1
                 27
                  9) 27 (3
                     27
∴ 9 is G. C. M.
```

```
(4)  55) 121 (2
         110
          11) 55 (5
              55
∴ 11 is G. C. M.
```

```
(5)  128) 324 (2
          256
           68) 128 (1
               68
               60) 68 (1
                   60
                    8) 60 (7
                       56
                        4) 8 (2
                           8
∴ 4 is G. C. M.
```

```
(6)  120) 320 (2
          240
           80) 120 (1
               80
               40) 80 (2
                   80
∴ 40 is G. C. M.
```

```
(7)  272) 425 (1
          272
          153) 272 (1
               153
               119) 153 (1
                    119
                     34) 119 (3
                         102
                          17) 34 (2
                              34
∴ 17 is G. C. M.
```

```
(8)  394) 672 (1
          394
          278) 394 (1
               278
               116) 278 (2
                    232
                     46) 116 (2
                         92
                         24) 46 (1
                             24
                             22) 24 (1
                                 22
                                  2) 22 (11
                                     22
∴ 2 is G. C. M.
```

```
(9)  720) 860 (1
          720
          140) 720 (5
               700
                20) 140 (7
                    140
∴ 20 is G. C. M.
```

(10) 825) 960 (1
825
135) 825 (6
810
15) 135 (9
135

∴ 15 is G. C. M.

(11) 775) 1800 (2
1550
250) 775 (3
750
25) 250 (10
250

∴ 25 is G. C. M.

(12) 856) 936 (1
856
80) 856 (10
80
56) 80 (1
56
24) 56 (2
48
8) 24 (3
24

∴ 8 is G. C. M.

(13) 176) 1000 (5
880
120) 176 (1
120
56) 120 (2
112
8) 56 (7
56

∴ 8 is G. C. M.

(14) 1236) 1632 (1
1236
396) 1236 (3
1188
48) 396 (8
384
12) 48 (4
48

∴ 12 is G. C. M.

(15) 6409) 7395 (1
6409
986) 6409 (6
5916
493) 986 (2
986

∴ 493 is G. C. M.

(16) 689) 1573 (2
1378
195) 689 (3
585
104) 195 (1
104
91) 104 (1
91
13) 91 (7
91

∴ 13 is G. C. M.

(17) 1729) 5850 (3
5187
663) 1729 (2
1326
403) 663 (1
403
260) 403 (1
260
143) 260 (1
143
117) 143 (1
117
26) 117 (4
104
13) 26 (2
26
∴ 13 is G. C. M.

(18) 5210) 5718 (1
5210
508) 5210 (10
508
130) 508 (3
390
118) 130 (1
118
12) 118 (9
108
10) 12 (1
10
2) 10 (5
10
∴ 2 is G. C. M.

(19) 2023) 7581 (3
6069
1512) 2023 (1
1512
511) 1512 (2
1022
490) 511 (1
490
21) 490 (23
42
70
63
7) 21 (3
21
∴ 7 is G. C. M.

(20) 468) 1266 (2
936
330) 468 (1
330
138) 330 (2
276
54) 138 (2
108
30) 54 (1
30
24) 30 (1
24
6) 24 (4
24
∴ 6 is G. C. M.

(21) 2484) 2628 (1
2484
144) 2484 (17
144
1044
1008
36) 144 (4
144
∴ 36 is G. C. M.

(22) 2268) 3444 (1
2268
1176) 2268 (1
1176
1092) 1176 (1
1092
84) 1092 (13
84
252
252

∴ 84 is G. C. M.

(23) 5544) 6552 (1
5544
1008) 5544 (5
5040
504) 1008 (2
1008

∴ 504 is G. C. M.

(24) 2573) 4067 (1
2573
1494) 2573 (1
1494
1079) 1494 (1
1079
415) 1079 (2
830
249) 415 (1
249
166) 249 (1
166
83) 166 (2
166

∴ 83 is G. C. M.

(25) 10395) 16819 (1
10395
6424) 10395 (1
6424
3971) 6424 (1
3971
2453) 3971 (1
2453
1518) 2453 (1
1518
935) 1518 (1
935
583) 935 (1
583
352) 583 (1
352
231) 352 (1
231
121) 231 (1
121
110) 121 (1
110
11) 110 (10
110

∴ 11 is G. C. M.

(26) 80934) 110331 (1
80934
29397) 80934 (2
58794
22140) 29397 (1
22140
7257) 22140 (3
21771
369) 7257 (19
369
3567
3321
246) 369 (1
246
123) 246 (2
246
∴ 123 is G. C. M.

(27) 1242) 2323 (1
1242
1081) 1242 (1
1081
161) 1081 (6
966
115) 161 (1
115
46) 115 (2
92
23) 46 (2
46
∴ 23 is G. C. M.

(28) 13536) 23148 (1
13536
9612) 13536 (1
9612
3924) 9612 (2
7848
1764) 3924 (2
3528
396) 1764 (4
1584
180) 396 (2
360
36) 180 (5
180
∴ 36 is G. C. M.

(29) 42237) 75582 (1
42237
33345) 42237 (1
33345
8892) 33345 (3
26676
6669) 8892 (1
6669
2223) 6669 (3
6669
∴ 2223 is G. C. M.

(30) 285714) 999999 (3
857142
142857) 285714 (2
285714
∴ 142857 is G. C. M.

(31) 10353) 14877 (1
10353
4524) 10353 (2
9048
1305) 4524 (3
3915
609) 1305 (2
1218
87) 609 (7
609
∴ 87 is G. C. M.

(32) 30599) 271469 (8
244792
26677) 30599 (1
26677
3922) 26677 (6
23532
3145) 3922 (1
3145
777) 3145 (4
3108
37) 777 (21
74
37
37
∴ 37 is G. C. M.

2. (1) 14) 18 (1
14
4) 14 (3
12
2) 4 (2
4
∴ 2 is G. C. M. of 14 and 18.

2) 24 (12
24
∴ 2 is G. C. M. required.

(2) 16) 24 (1
16
8) 16 (2
16
∴ 8 is the G. C. M. of 16 and 24.

8) 48 (6
48
∴ 8 is the G. C. M. of 16, 24, and 48.

8) 74 (9
72
2) 8 (4
8
∴ 2 is the G. C. M. required.

(3) 13) 52 (4
52

∴ 13 is G.C.M. of 13 and 52.

13) 416 (32
39
26
26

∴ 13 is G.C.M. of 13, 52, and 416.

13) 78 (6
78

∴ 13 is G.C.M. required.

(4) 837) 1134 (1
837
297) 837 (2
594
243) 297 (1
243
54) 243 (4
216
27) 54 (2
54

∴ 27 is G.C.M. of 837 and 1134.

27) 1347 (49
108
267
243
24) 27 (1
24
3) 24 (8
24

∴ 3 is the G.C.M. required.

(5) 805) 1311 (1
805
506) 805 (1
506
299) 506 (1
299
207) 299 (1
207
92) 207 (2
184
23) 92 (4
92

∴ 23 is G.C.M. of 805 and 1311.

23) 1978 (86
184
138
138

∴ 23 is G.C.M. required.

(6) 28) 84 (3
84

∴ 28 is G.C.M. of 28 and 84.

28) 154 (5
140
14) 28 (2
28

∴ 14 is G.C.M. of 28, 84, and 154.

14) 343 (24
28
63
56
7) 14 (2
14

∴ 7 is the G.C.M. required.

(7) 504) 5292 (10
504
252) 504 (2
504

∴ 252 is G. C. M. of 504 and 5292.

252) 1520 (6
1512
8) 252 (31
24
12
8
4) 8 (2
8

∴ 4 is G. C. M. required.

(8) 396) 5184 (13
396
1224
1188
36) 396 (11
36
36
36

∴ 36 is G. C. M. of 396 and 5184.

36) 6914 (192
36
331
324
74
72
2) 36 (18
36

∴ 2 is G. C. M. required.

LEAST COMMON MULTIPLE.

Ex. VIII. (p. 30.)

1. (1) 16) 24 (1
16
8) 16 (2
16

∴ 8 is the G. C. M. of 16 and 24;

$$\therefore \text{L. C. M.} = \frac{16 \times 24}{8} = \frac{384}{8} = 48.$$

(2) 36) 75 (2
72
3) 36 (12
36

∴ 3 is the G. C. M. of 36 and 75;

$$\therefore \text{L. C. M.} = \frac{36 \times 75}{3} = \frac{2700}{3} = 900.$$

(3) 7) 15 (2
14
1) 7 (7
7

∴ 1 is the G. C. M. of 7 and 15;

$$\therefore \text{L. C. M.} = \frac{7 \times 15}{1} = 105.$$

(4) 28) 35 (1
28
7) 28 (4
28

∴ 7 is the G. C. M. of 28 and 35;

$$\therefore \text{L. C. M.} = \frac{28 \times 35}{7} = \frac{980}{7} = 140.$$

(5) 319) 407 (1
319
88) 319 (3
264
55) 88 (1
55
33) 55 (1
33
22) 33 (1
22
11) 22 (2
22

∴ 11 is the G. C. M. of 319 and 407;

$$\therefore \text{L. C. M.} = \frac{319 \times 407}{11} = \frac{129833}{11} = 11803.$$

(6) 333) 504 (1
333
171) 333 (1
171
162) 171 (1
162
9) 162 (18
9
72
72

∴ 9 is the G. C. M. of 333 and 504;

$$\therefore \text{L. C. M.} = \frac{333 \times 504}{9} = \frac{167832}{9} = 18648.$$

(7) 799) 2961 (3
2397
564) 799 (1
564
235) 564 (2
470
94) 235 (2
188
47) 94 (2
94

∴ 47 is the G. C. M. of 2961 and 799;

$$\therefore \text{L. C. M.} = \frac{2961 \times 799}{47} = \frac{2365839}{47} = 50337.$$

(8) 7568) 9504 (1
7568
1936) 7568 (3
5808
1760) 1936 (1
1760
176) 1760 (10
1760

∴ 176 is the G. C. M. of 7568 and 9504;

$$\therefore \text{L. C. M.} = \frac{7568 \times 9504}{176} = \frac{71926272}{176} = 408672.$$

(9) 4662) 5476 (1
4662
814) 4662 (5
4070
592) 814 (1
592
222) 592 (2
444
148) 222 (1
148
74) 148 (2
148

∴ 74 is the G. C. M. of 4662 and 5476;

$$\therefore \text{L. C. M.} = \frac{4662 \times 5476}{74} = \frac{25529112}{74} = 344988.$$

(10) 6327) 23997 (3
18981
5016) 6327 (1
5016
1311) 5016 (3
3933
1083) 1311 (1
1083
228) 1083 (4
912
171) 228 (1
171
57) 171 (3
171

∴ 57 is the G. C. M. of 6327 and 23997;

$$\therefore \text{L. C. M.} = \frac{6327 \times 23997}{57} = \frac{151829019}{57} = 2663667.$$

(11) 5415) 30105 (5
27075
3030) 5415 (1
3030
2385) 3030 (1
2385
645) 2385 (3
1935
450) 645 (1
450
195) 450 (2
390
60) 195 (3
180
15) 60 (4
60

∴ 15 is the G. C. M. of 5415 and 30105;

$$\therefore \text{L. C. M.} = \frac{5415 \times 30105}{15}$$

$$= \frac{163018575}{15}$$

$$= 10867905.$$

(12)

$$\begin{array}{l}
15863)\ 21489\ (1 \\
\qquad\quad \underline{15863} \\
\qquad\quad 5626)\ 15863\ (2 \\
\qquad\qquad\qquad \underline{11252} \\
\qquad\qquad\qquad 4611)\ 5626\ (1 \\
\qquad\qquad\qquad\qquad\quad \underline{4611} \\
\qquad\qquad\qquad\qquad\quad 1015)\ 4611\ (4 \\
\qquad\qquad\qquad\qquad\qquad\qquad \underline{4060} \\
\qquad\qquad\qquad\qquad\qquad\qquad 551)\ 1015\ (1 \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad \underline{551} \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad 464)\ 551\ (1 \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \underline{464} \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad 87)\ 464\ (5 \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \underline{435} \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad 29)\ 87\ (3 \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \underline{87}
\end{array}$$

∴ 29 is the G.C.M. of 15863 and 21489;

$$\therefore \text{L.C.M.} = \frac{15863 \times 21489}{29}$$

$$= \frac{340880007}{29}$$

$$= 11754483.$$

2. (1)

$$\begin{array}{r|l}
2 & 12,\ 8,\ 9 \\ \hline
2 & 6,\ 4,\ 9 \\ \hline
3 & 3,\ 2,\ 9 \\ \hline
 & 1,\ 2,\ 3
\end{array}$$

$\therefore \text{L.C.M.} = 2 \times 2 \times 3 \times 2 \times 3$
$= 72.$

(2)

$$\begin{array}{r|l}
2 & 8,\ 12,\ 16 \\ \hline
2 & 4,\ 6,\ 8 \\ \hline
2 & 2,\ 3,\ 4 \\ \hline
 & 1,\ 3,\ 2
\end{array}$$

$\therefore \text{L.C.M.} = 2 \times 2 \times 2 \times 3 \times 2$
$= 48.$

(3)

$$\begin{array}{r|l}
2 & 6,\ 10,\ 15 \\ \hline
3 & 3,\ 5,\ 15 \\ \hline
5 & 1,\ 5,\ 5 \\ \hline
 & 1,\ 1,\ 1
\end{array}$$

$\therefore \text{L.C.M.} = 2 \times 3 \times 5$
$= 30.$

(4)

$$\begin{array}{r|l}
2 & 8,\ 12,\ 20 \\ \hline
2 & 4,\ 6,\ 10 \\ \hline
 & 2,\ 3,\ 5
\end{array}$$

$\therefore \text{L.C.M.} = 2 \times 2 \times 2 \times 3 \times 5$
$= 120.$

(5)
$$\begin{array}{r|rrr} 3 & 27, & 24, & 15 \\ \hline & 9, & 8, & 5 \end{array}$$

∴ L. C. M. $=3\times9\times8\times5$
$=1080$.

(6)
$$\begin{array}{r|rrr} 2 & 12, & 51, & 68 \\ \hline 2 & 6, & 51, & 34 \\ \hline 3 & 3, & 51, & 17 \\ \hline 17 & 1, & 17, & 17 \\ \hline & 1, & 1, & 1 \end{array}$$

∴ L. C. M. $=2\times2\times3\times17$
$=204$.

(7)
$$\begin{array}{r|rrr} 19 & 19, & 29, & 38 \\ \hline & 1, & 29, & 2 \end{array}$$

∴ L. C. M. $=19\times29\times2$
$=1102$.

(8)
$$\begin{array}{r|rrrr} 2 & 24, & 48, & 64, & 192 \\ \hline 2 & 12, & 24, & 32, & 96 \\ \hline 2 & 6, & 12, & 16, & 48 \\ \hline 2 & 3, & 6, & 8, & 24 \\ \hline 2 & 3, & 3, & 4, & 12 \\ \hline 2 & 3, & 3, & 2, & 6 \\ \hline 3 & 3, & 3, & 1, & 3 \\ \hline & 1, & 1, & 1, & 1 \end{array}$$

∴ L. C. M. $=2\times2\times2\times2\times2\times2\times3$
$=192$.

(9)
$$\begin{array}{r|rrrr} 2 & 63, & 12, & 84, & 14 \\ \hline 2 & 63, & 6, & 42, & 7 \\ \hline 3 & 63, & 3, & 21, & 7 \\ \hline 7 & 21, & 1, & 7, & 7 \\ \hline & 3, & 1, & 1, & 1 \end{array}$$

∴ L. C. M. $=2\times2\times3\times7\times3$
$=252$.

(10)
$$\begin{array}{r|rrrrr} 3 & 5, & 7, & 9, & 11, & 15 \\ \hline 5 & 5, & 7, & 3, & 11, & 5 \\ \hline & 1, & 7, & 3, & 11, & 1 \end{array}$$

∴ L. C. M. $=3\times5\times7\times3\times11$
$=3465$.

(11)
$$\begin{array}{r|rrrr} 2 & 6, & 15, & 24, & 25 \\ \hline 3 & 3, & 15, & 12, & 25 \\ \hline 5 & 1, & 5, & 4, & 25 \\ \hline & 1, & 1, & 4, & 5 \end{array}$$

∴ L. C. M. $=2\times3\times5\times4\times5$
$=600$.

(12)
$$\begin{array}{r|rrrrr} 2 & 12, & 18, & 30, & 48, & 60 \\ \hline 2 & 6, & 9, & 15, & 24, & 30 \\ \hline 3 & 3, & 9, & 15, & 12, & 15 \\ \hline 5 & 1, & 3, & 5, & 4, & 5 \\ \hline & 1, & 3, & 1, & 4, & 1 \end{array}$$

∴ L. C. M. $=2\times2\times3\times5\times3\times4$
$=720$.

(13)
$$\begin{array}{r|rrrr} 3 & 15, & 35, & 63, & 72 \\ \hline 3 & 5, & 35, & 21, & 24 \\ \hline 5 & 5, & 35, & 7, & 8 \\ \hline 7 & 1, & 7, & 7, & 8 \\ \hline & 1, & 1, & 1, & 8 \end{array}$$

∴ L. C. M. $=3\times3\times5\times7\times8$
$=2520$.

(14)
$$\begin{array}{r|rrrr}
2 & 9, & 12, & 14, & 210 \\ \hline
3 & 9, & 6, & 7, & 105 \\ \hline
7 & 3, & 2, & 7, & 35 \\ \hline
 & 3, & 2, & 1, & 5
\end{array}$$

∴ L.C.M. $=2\times3\times7\times3\times2\times5$
$=1260.$

(15)
$$\begin{array}{r|rrrr}
2 & 54, & 81, & 63, & 14 \\ \hline
3 & 27, & 81, & 63, & 7 \\ \hline
3 & 9, & 27, & 21, & 7 \\ \hline
3 & 3, & 9, & 7, & 7 \\ \hline
7 & 1, & 3, & 7, & 7 \\ \hline
 & 1, & 3, & 1, & 1
\end{array}$$

∴ L.C.M. $=2\times3\times3\times3\times7\times3$
$=1134.$

(16)
$$\begin{array}{r|rrrrr}
2 & 24, & 10, & 32, & 45, & 25 \\ \hline
2 & 12, & 5, & 16, & 45, & 25 \\ \hline
2 & 6, & 5, & 8, & 45, & 25 \\ \hline
3 & 3, & 5, & 4, & 45, & 25 \\ \hline
5 & 1, & 5, & 4, & 15, & 25 \\ \hline
 & 1, & 1, & 4, & 3, & 5
\end{array}$$

∴ L.C.M. $=2\times2\times2\times3\times5\times4\times3\times5$
$=7200.$

(17)
$$\begin{array}{r|rrrrrrrrr}
2 & 1, & 2, & 3, & 4, & 5, & 6, & 7, & 8, & 9 \\ \hline
2 & 1, & 1, & 3, & 2, & 5, & 3, & 7, & 4, & 9 \\ \hline
3 & 1, & 1, & 3, & 1, & 5, & 3, & 7, & 2, & 9 \\ \hline
 & 1, & 1, & 1, & 1, & 5, & 1, & 7, & 2, & 3
\end{array}$$

∴ L.C.M. $=2\times2\times3\times5\times7\times2\times3$
$=2520.$

(18)
$$\begin{array}{r|rrrrrrr}
2 & 7, & 8, & 9, & 18, & 24, & 72, & 144 \\ \hline
2 & 7, & 4, & 9, & 9, & 12, & 36, & 72 \\ \hline
2 & 7, & 2, & 9, & 9, & 6, & 18, & 36 \\ \hline
3 & 7, & 1, & 9, & 9, & 3, & 9, & 18 \\ \hline
3 & 7, & 1, & 3, & 3, & 1, & 3, & 6 \\ \hline
 & 7, & 1, & 1, & 1, & 1, & 1, & 2
\end{array}$$

∴ L.C.M. $=2\times2\times2\times3\times3\times7\times2$
$=1008.$

(19)
$$\begin{array}{r|rrrrrrr}
2 & 12, & 20, & 24, & 54, & 81, & 63, & 14 \\ \hline
2 & 6, & 10, & 12, & 27, & 81, & 63, & 7 \\ \hline
3 & 3, & 5, & 6, & 27, & 81, & 63, & 7 \\ \hline
3 & 1, & 5, & 2, & 9, & 27, & 21, & 7 \\ \hline
3 & 1, & 5, & 2, & 3, & 9, & 7, & 7 \\ \hline
7 & 1, & 5, & 2, & 1, & 3, & 7, & 7 \\ \hline
 & 1, & 5, & 2, & 1, & 3, & 1, & 1
\end{array}$$

∴ L.C.M. $=2\times2\times3\times3\times3\times7\times5\times2\times3$
$=22680.$

(20)
$$\begin{array}{r|rrrrr}
3 & 225, & 255, & 289, & 1023, & 4095 \\ \hline
3 & 75, & 85, & 289, & 341, & 1365 \\ \hline
5 & 25, & 85, & 289, & 341, & 455 \\ \hline
5 & 5, & 17, & 289, & 341, & 91 \\ \hline
7 & 1, & 17, & 289, & 341, & 91 \\ \hline
13 & 1, & 17, & 289, & 341, & 13 \\ \hline
17 & 1, & 17, & 289, & 341, & 1 \\ \hline
 & 1, & 1, & 17, & 341, & 1
\end{array}$$

∴ L.C.M. $=3\times3\times5\times5\times7\times13\times17\times17\times341$
$=2017790775.$

MISCELLANEOUS QUESTIONS.

Ex. IX. (p. 31.)

I.

(1)
$$\begin{array}{r} 603\\ 48\\ \hline 4824\\ 2412\\ \hline 28944\\ \hline \end{array}$$

(2) Nine millions, ninety thousand, nine hundred and nine.
Ninety thousand, nine hundred and nine.

$$\begin{array}{r} 9090909\\ 90909\\ \hline 9181818\\ \hline \end{array} \qquad \begin{array}{r} 9090909\\ 90909\\ \hline 9000000\\ \hline \end{array}$$

(3)
$$\begin{array}{r} 4715\\ 398\\ \hline 37720\\ 42435\\ 14145\\ \hline 1876570\\ \hline \end{array} \qquad \begin{array}{r} 2017\\ 408\\ \hline 16136\\ 8068\\ \hline 822936\\ \hline \end{array} \qquad \begin{array}{r} 1876570\\ 822936\\ \hline 1053634\\ \hline \end{array}$$

(4) Son's age $= 73$ years $- 37$ years
$= 36$ years.

(5)
$$\begin{aligned} &15\times\overline{37153}-73474-67152\div4+40734\times2\\ &=557295-73474-16788+81468\\ &=483821-16788+81468\\ &=467033+81468\\ &=548501. \end{aligned}$$

II.

(2)
$$\begin{array}{l} 45)\;18675\;(415\\ \underline{180}\\ 67\\ \underline{45}\\ 225\\ \underline{225} \end{array} \qquad \begin{array}{l} 5{,}0)\;\underline{7925{,}0}\\ \phantom{5{,}0)\;}\underline{1585} \end{array}$$

∴ in one year the deaths amount to

$$415+1585=2000;$$

∴ n°. of years required $=10000\div2000$
$=5.$

(3) 7004090000000000000.

(4) Since

$$\begin{aligned} 494871-94853&=400018,\\ 45079-\ 3177&=\ 41902,\\ 54312-\ 3987&=\ 50325,\\ 1763+\ 231&=\ 1994,\\ 379\times\ 379&=143641, \end{aligned}$$

the expression is equal to

$$\begin{aligned} &400018+41902-50325-1994+143641\\ &=441920-50325-1994+143641\\ &=391595-1994+143641\\ &=389601+143641\\ &=533242. \end{aligned}$$

(5) Number required $=528\times36+44$

$$\begin{aligned} &=19008+44\\ &=19052. \end{aligned}$$

III.

(2)

$$\begin{array}{r@{\,}l} & 15683\\ & \underline{\ \ 9892}\\ 85) & 25575\ (300\\ & \underline{255}\\ & \underline{\qquad 75} \end{array}$$

∴ number of days $=300$, and there will be 75 lines remaining.

(3)

$$\begin{array}{r|rrrrr} 2 & 12, & 16, & 21, & 52, & 70\\ \hline 2 & 6, & 8, & 21, & 26, & 35\\ \hline 3 & 3, & 4, & 21, & 13, & 35\\ \hline 7 & 1, & 4, & 7, & 13, & 35\\ \hline & 1, & 4, & 1, & 13, & 5 \end{array}$$

∴ L. C. M. $=2\times2\times3\times7\times4\times13\times5$
$=21840.$

(4) $(7854-4913)\times3=2941\times3=8823,$
$(20374-12530)\div53=7844\div53=148,$
$(395456-2364)\div556=393092\div556=707;$

∴ the expression is equal to

$$\begin{aligned} &8823-148-6+707\\ &=8675-6+707\\ &=8669+707\\ &=9376. \end{aligned}$$

(5) *A*, *B* and *C* score 108 runs,
B and *C* " 90 runs,
A and *C* " 51 runs;

∴ *A* scores (108 − 90) runs = 18 runs,
B " (108 − 51) runs = 57 runs;

∴ *A* and *B* score (18 + 57) runs = 75 runs,

∴ *C* scores (108 − 75) runs = 33 runs.

IV.

(1) *Ans.* 24570.

(2) The smaller = 373625 ÷ 875
= 427;

∴ sum of numbers = 875 + 427 = 1302,
difference = 875 − 427 = 448.

(3) Son's age will be (50 − 21) years = 29 years,
Father's " " (50 + 21) years = 71 years.

(4) 100100101;

One thousand and ten millions, one hundred and one thousand and ten;

1840.

(5)
$$\begin{array}{l}
849)\ 1132\ (1 \\
\underline{849} \\
283)\ 849\ (3 \\
\underline{849}
\end{array}$$

∴ 283 is the G. C. M.,

$$\text{and L. C. M.} = \frac{849 \times 1132}{283} = \frac{961068}{283} = 3396.$$

V.

(1)
$$\begin{array}{r}
478 \\
\underline{146} \\
2868 \\
1912 \\
478 \\
\hline
69788
\end{array}
\qquad
\begin{array}{l}
99)\ 4843\ (48 \\
\underline{396} \\
883 \\
\underline{792} \\
91
\end{array}$$

(2) Number = 163 × 430 ÷ 86
= 70090 ÷ 86
= 815

(3) In each 12 persons, 2 speak German, 3 speak Tschech, and 7 speak German and Tschech;

∴ in 120000 persons,
20000 speak German,
30000 " Tschech,
70000 " German and Tschech.

(4) His property $= £(10000+15000+5500\times4+3750\times3+4563+599)$
$= £(10000+15000+22000+11250+4563+599)$
$= £63412$.

(5) Divisor $=(9281-373)\div17$
$=8908\div17$
$=524$.

VI.

(1) MDLXIII. and $\overline{\text{IX}}$.

(3) Divisor $=97+665+91=853$;

∴ dividend $=853\times665+97$
$=567245+97$
$=567342$.

(4) Two hundred and seventy thousand, one hundred and thirty; twenty-six thousand, seven hundred and eighty-four; 10234.

$$\begin{array}{r@{\,}l} 8) & \underline{10234} \\ & \underline{1279}-2 \text{ remainder;} \end{array}$$

∴ 6 is the number required.

(5) Two years since eldest son's age $= \frac{58}{2} = 29$;

∴ eldest son's age now $=31$,

youngest son's age $= \frac{60+31}{7} = \frac{91}{7} = 13$,

daughter's age $=60-(31+13)$
$=60-44$
$=16$.

VULGAR FRACTIONS.

Ex. X. (p. 36.)

(1) $\frac{5}{12} \times 3 = \frac{15}{12}$; $\frac{5}{12} \times 9 = \frac{45}{12}$; $\frac{5}{12} \times 12 = \frac{60}{12}$; $\frac{5}{12} \times 36 = \frac{180}{12}$.

(2) $\frac{41}{63} \times 7 = \frac{287}{63}$; $\frac{41}{63} \times 15 = \frac{615}{63}$; $\frac{41}{63} \times 21 = \frac{861}{63}$; $\frac{41}{63} \times 45 = \frac{1845}{63}$.

Ex. XI. (p. 36.)

(1) $\frac{5}{8} \div 2 = \frac{5}{8 \times 2} = \frac{5}{16}$; $\frac{5}{8} \div 3 = \frac{5}{8 \times 3} = \frac{5}{24}$; $\frac{5}{8} \div 4 = \frac{5}{8 \times 4} = \frac{5}{32}$;
$\frac{5}{8} \div 5 = \frac{5}{8 \times 5} = \frac{5}{40}$; $\frac{5}{8} \div 10 = \frac{5}{8 \times 10} = \frac{5}{80}$.

(2) $\frac{15}{587} \div 11 = \frac{15}{587 \times 11} = \frac{15}{6457}$; $\frac{15}{587} \div 20 = \frac{15}{587 \times 20} = \frac{15}{11740}$;
$\frac{15}{587} \div 25 = \frac{15}{587 \times 25} = \frac{15}{14675}$; $\frac{15}{587} \div 45 = \frac{15}{587 \times 45} = \frac{15}{26415}$.

Ex. XII. (p. 37.)

(1) $7 = \frac{7}{1} = \frac{7 \times 3}{1 \times 3} = \frac{21}{3}$; $7 = \frac{7}{1} = \frac{7 \times 7}{1 \times 7} = \frac{49}{7}$; $7 = \frac{7}{1} = \frac{7 \times 22}{1 \times 22} = \frac{154}{22}$;
$9 = \frac{9}{1} = \frac{9 \times 3}{1 \times 3} = \frac{27}{3}$; $9 = \frac{9}{1} = \frac{9 \times 7}{1 \times 7} = \frac{63}{7}$; $9 = \frac{9}{1} = \frac{9 \times 22}{1 \times 22} = \frac{198}{22}$;
$11 = \frac{11}{1} = \frac{11 \times 3}{1 \times 3} = \frac{33}{3}$; $11 = \frac{11}{1} = \frac{11 \times 7}{1 \times 7} = \frac{77}{7}$;
$11 = \frac{11}{1} = \frac{11 \times 22}{1 \times 22} = \frac{242}{22}$.

(2) $26 = \frac{26}{1} = \frac{26 \times 2}{1 \times 2} = \frac{52}{2}$; $26 = \frac{26}{1} = \frac{26 \times 5}{1 \times 5} = \frac{130}{5}$;
$26 = \frac{26}{1} = \frac{26 \times 13}{1 \times 13} = \frac{338}{13}$; $26 = \frac{26}{1} = \frac{26 \times 23}{1 \times 23} = \frac{598}{23}$;
$26 = \frac{26}{1} = \frac{26 \times 35}{1 \times 35} = \frac{910}{35}$;

$$109=\frac{109}{1}=\frac{109\times2}{1\times2}=\frac{218}{2};\quad 109=\frac{109}{1}=\frac{109\times5}{1\times5}=\frac{545}{5};$$

$$109=\frac{109}{1}=\frac{109\times13}{1\times13}=\frac{1417}{13};\quad 109=\frac{109}{1}=\frac{109\times23}{1\times23}=\frac{2507}{23};$$

$$109=\frac{109}{1}=\frac{109\times35}{1\times35}=\frac{3815}{35};$$

$$117=\frac{117}{1}=\frac{117\times2}{1\times2}=\frac{234}{2};\quad 117=\frac{117}{1}=\frac{117\times5}{1\times5}=\frac{585}{5};$$

$$117=\frac{117}{1}=\frac{117\times13}{1\times13}=\frac{1521}{13};\quad 117=\frac{117}{1}=\frac{117\times23}{1\times23}=\frac{2691}{23};$$

$$117=\frac{117}{1}=\frac{117\times35}{1\times35}=\frac{4095}{35};$$

$$125=\frac{125}{1}=\frac{125\times2}{1\times2}=\frac{250}{2};\quad 125=\frac{125}{1}=\frac{125\times5}{1\times5}=\frac{625}{5};$$

$$125=\frac{125}{1}=\frac{125\times13}{1\times13}=\frac{1625}{13};\quad 125=\frac{125}{1}=\frac{125\times23}{1\times23}=\frac{2875}{23};$$

$$125=\frac{125}{1}=\frac{125\times35}{1\times35}=\frac{4375}{35}.$$

Ex. XIII. (p. 38.)

(1) $\frac{15}{4}=3\frac{3}{4}$. (2) $\frac{77}{6}=12\frac{5}{6}$. (3) $\frac{49}{8}=6\frac{1}{8}$. (4) $\frac{113}{9}=12\frac{5}{9}$.

(5) $\frac{63}{7}=9$. (6) $\frac{443}{12}=36\frac{11}{12}$. (7) $\frac{587}{13}=45\frac{2}{13}$.

(8) $\frac{183}{55}=3\frac{18}{55}$. (9) $\frac{751}{24}=31\frac{7}{24}$. (10) $\frac{5801}{63}=92\frac{5}{63}$.

(11) $\frac{648}{108}=6$. (12) $\frac{5876}{157}=37\frac{67}{157}$. (13) $\frac{10000}{111}=90\frac{10}{111}$.

(14) $\frac{231750}{153}=1514\frac{108}{153}$. (15) $\frac{14264}{239}=59\frac{163}{239}$. (16) $\frac{95950}{999}=96\frac{46}{999}$.

(17) $\frac{25713}{1168}=22\frac{17}{1168}$. (18) $\frac{632625}{1741}=363\frac{642}{1741}$.

(19) $\frac{978911}{36425}=26\frac{31861}{36425}$. (20) $\frac{46325}{3724}=12\frac{1637}{3724}$.

Ex. XIV. (p. 39.)

(1) $2\frac{1}{3}=\frac{2\times3+1}{3}=\frac{7}{3}$.

(2) $5\frac{3}{7}=\frac{5\times7+3}{7}=\frac{38}{7}$.

(3) $4\frac{5}{9}=\frac{4\times9+5}{9}=\frac{41}{9}$.

(4) $7\frac{2}{5}=\frac{7\times5+2}{5}=\frac{37}{5}$.

(5) $25\frac{11}{12}=\frac{25\times12+11}{12}=\frac{311}{12}$.

(6) $43\frac{7}{11}=\frac{43\times11+7}{11}=\frac{480}{11}$.

(7) $25\frac{1}{13}=\frac{25\times13+1}{19}=\frac{325+1}{13}=\frac{326}{13}$.

(8) $14\frac{13}{15}=\frac{14\times15+13}{15}=\frac{210+13}{15}=\frac{223}{15}$.

(9) $2003\frac{1}{7}=\frac{2003\times7+1}{7}=\frac{14021+1}{7}=\frac{14022}{7}$.

(10) $857\frac{11}{13}=\frac{857\times13+11}{13}=\frac{11141+11}{13}=\frac{11152}{13}$.

(11) $57\frac{31}{43}=\frac{57\times43+31}{43}=\frac{2451+31}{43}=\frac{2482}{43}$.

(12) $13\frac{83}{84}=\frac{13\times84+83}{84}=\frac{1092+83}{84}=\frac{1175}{84}$.

(13) $3\frac{95}{224}=\frac{3\times224+95}{224}=\frac{672+95}{224}=\frac{767}{224}$.

(14) $26\frac{201}{202}=\frac{26\times202+201}{202}=\frac{5252+201}{202}=\frac{5453}{202}$.

(15) $164\frac{118}{441}=\frac{164\times441+118}{441}=\frac{72324+118}{441}=\frac{72442}{441}$.

(16) $106\frac{119}{851}=\frac{106\times851+119}{851}=\frac{90206+119}{851}=\frac{90325}{851}$.

(17) $157\frac{122}{137}=\frac{157\times137+122}{137}=\frac{21509+122}{137}=\frac{21631}{137}$.

(18) $17\frac{2605}{2859}=\frac{17\times2859+2605}{2859}=\frac{48603+2605}{2859}=\frac{51208}{2859}$.

(19) $427\frac{5}{1107}=\frac{427\times1107+5}{1107}=\frac{472689+5}{1107}=\frac{472694}{1107}$.

(20) $100\frac{413}{720}=\frac{100\times720+413}{720}=\frac{72000+413}{720}=\frac{72413}{720}$.

Ex. XV. (p. 40.)

Note.—In the following Examples, common factors are struck out of numerator and denominator.

(1) $\frac{2}{3}$ of $\frac{4}{5}=\frac{2\times4}{3\times5}=\frac{8}{15}$. (2) $\frac{6}{7}$ of $\frac{9}{10}=\frac{6\times9}{7\times10}=\frac{2\times3\times9}{7\times2\times5}=\frac{27}{35}$.

(3) $\frac{2}{5}$ of $\frac{3}{4}=\frac{2\times3}{5\times4}=\frac{2\times3}{5\times2\times2}=\frac{3}{10}$. (4) $\frac{5}{6}$ of $\frac{11}{12}=\frac{5\times11}{6\times12}=\frac{55}{72}$.

(5) $\frac{7}{8}$ of $\frac{5}{6}$ of $7=\frac{7\times5\times7}{8\times6}=\frac{245}{48}$.

(6) $\frac{5}{8}$ of $\frac{3}{7}$ of $\frac{2}{3}$ of $\frac{1}{15}$ of $28=\frac{5\times3\times2\times28}{8\times7\times3\times15}=\frac{5\times3\times2\times4\times7}{2\times4\times7\times3\times5\times3}=\frac{1}{3}$.

(7) $\frac{5}{11}$ of $2\frac{1}{2}$ of $\frac{5}{7}$ of $10\frac{1}{2}=\frac{5}{11}$ of $\frac{5}{2}$ of $\frac{5}{7}$ of $\frac{21}{2}=\frac{5\times5\times5\times3\times7}{11\times2\times7\times2}=\frac{375}{44}$.

(8) $\frac{7}{9}$ of $12\frac{1}{2}$ of $\frac{4}{5}$ of $\frac{5}{6}$ of $\frac{3}{8}$ of 9

$=\frac{7}{9}$ of $\frac{25}{2}$ of $\frac{4}{5}$ of $\frac{5}{6}$ of $\frac{3}{8}$ of $9=\frac{7\times25\times4\times5\times3\times9}{9\times2\times5\times2\times3\times2\times4}=\frac{175}{8}$.

(9) $\frac{5}{18}$ of $\frac{7}{3}$ of $\frac{36}{10}$ of $\frac{9}{4}$ of $\frac{3}{10}$ of 2 of $\frac{8}{27}$

$$=\frac{5\times7\times36\times9\times3\times2\times8}{18\times3\times10\times4\times10\times27}$$

$$=\frac{5\times7\times18\times2\times9\times3\times2\times4\times2}{18\times3\times5\times2\times4\times5\times2\times3\times9}$$

$$=\frac{14}{15}.$$

(10) $\frac{5}{7}$ of $\frac{3}{8}$ of $\frac{6}{7}$ of $70\frac{2}{9}$ of $\frac{3}{40}$ of $1\frac{7}{11}$ of 147

$=\frac{5}{7}$ of $\frac{3}{8}$ of $\frac{6}{7}$ of $\frac{632}{9}$ of $\frac{3}{40}$ of $\frac{18}{11}$ of 147

$$=\frac{5\times3\times6\times632\times3\times18\times147}{7\times8\times7\times9\times40\times11}$$

$$=\frac{5\times3\times2\times3\times8\times79\times3\times9\times2\times7\times7\times3}{7\times2\times2\times2\times7\times9\times8\times5\times11}$$

$$=\frac{3\times3\times79\times3\times3}{2\times11}$$

$$=\frac{6399}{22}.$$

Ex. XVI. (p. 41.)

In each of the following Examples we divide numerator and denominator by their G. C. M.

Thus in (1) $\frac{4}{8}=\frac{4}{4\times 2}=\frac{1}{2}$ (dividing by 4, the G. C. M.);

or, as we shall write it in the following Examples,

$$\frac{4}{8}=\frac{4\div 4}{8\div 4}=\frac{1}{2}.$$

(2) $\frac{10}{15}=\frac{10\div 5}{15\div 5}=\frac{2}{3}$.

(3) $\frac{14}{21}=\frac{14\div 7}{21\div 7}=\frac{2}{3}$.

(4) $\frac{18}{45}=\frac{18\div 9}{45\div 9}=\frac{2}{5}$.

(5) $\frac{56}{63}=\frac{56\div 7}{63\div 7}=\frac{8}{9}$.

(6) $\frac{54}{81}=\frac{54\div 27}{81\div 27}=\frac{2}{3}$.

(7) $\frac{63}{135}=\frac{63\div 9}{135\div 9}=\frac{7}{15}$.

(8) $\frac{66}{121}=\frac{66\div 11}{121\div 11}=\frac{6}{11}$.

(9) $\frac{246}{342}=\frac{246\div 6}{342\div 6}=\frac{41}{57}$.

(10) $\frac{247}{323}=\frac{247\div 19}{323\div 19}=\frac{13}{17}$.

(11) $\frac{272}{425}=\frac{272\div 17}{425\div 17}=\frac{16}{25}$.

(12) $\frac{330}{726}=\frac{330\div 66}{726\div 66}=\frac{5}{11}$.

(13) $\frac{825}{2709}=\frac{825\div 3}{2709\div 3}=\frac{275}{903}$.

(14) $\frac{630}{936}=\frac{630\div 18}{936\div 18}=\frac{35}{52}$.

(15) $\frac{324}{612}=\frac{324\div 36}{612\div 36}=\frac{9}{17}$.

(16) $\frac{936}{2368}=\frac{936\div 8}{2368\div 8}=\frac{117}{296}$.

(17) $\frac{5184}{6912}=\frac{5184\div 1728}{6912\div 1728}=\frac{3}{4}$.

(18) $\frac{3444}{3556}=\frac{3444\div 28}{3556\div 28}=\frac{123}{127}$.

(19) $\frac{7845}{96780}=\frac{7845\div 15}{96780\div 15}=\frac{523}{6452}$.

(20) $\frac{2472}{3264}=\frac{2472\div 24}{3264\div 24}=\frac{103}{136}$.

(21) $\frac{625}{9000}=\frac{625\div 125}{9000\div 125}=\frac{5}{72}$.

(22) $\frac{81}{4872}=\frac{81\div 3}{4872\div 3}=\frac{27}{1624}$.

(23) $\frac{1632}{2976}=\frac{1632\div 96}{2976\div 96}=\frac{17}{31}$.

(24) $\frac{10265}{14371}=\frac{10265\div 2053}{14371\div 2053}=\frac{5}{7}$.

(25) $\frac{4301}{95897}=\frac{4301\div 17}{95897\div 17}=\frac{253}{5641}$.

(26) $\frac{55247}{74841}=\frac{55247\div 101}{74841\div 101}=\frac{547}{741}$.

(27) $\frac{6093}{9174}=\frac{6093\div 3}{9174\div 3}=\frac{2031}{3058}$.

(28) $\frac{10812}{22800}=\frac{10812\div 12}{22800\div 12}=\frac{901}{1900}$.

(29) $\frac{25194}{88179}=\frac{25194\div12597}{88179\div12597}=\frac{2}{7}$.

(30) $\frac{374192}{575680}=\frac{374192\div16}{575680\div16}=\frac{23387}{35980}$.

(31) $\frac{114135}{220661}=\frac{114135\div7609}{220661\div7609}=\frac{15}{29}$.

(32) $\frac{128352}{238368}=\frac{128352\div18336}{238368\div18336}=\frac{7}{13}$.

Ex. XVII. (p. 43.)

(1) $\frac{1}{2}, \frac{2}{3}, \frac{4}{5}$. 30 is L.C.M. of denominators;

∴ fractions become $\frac{1\times15}{2\times15}, \frac{2\times10}{3\times10}, \frac{4\times6}{5\times6}$, or $\frac{15}{30}, \frac{20}{30}, \frac{24}{30}$.

(2) $\frac{2}{5}, \frac{7}{8}$. 40 is L.C.M. of denominators;

∴ fractions become $\frac{2\times8}{5\times8}, \frac{7\times5}{8\times5}$, or $\frac{16}{40}, \frac{35}{40}$.

(3) $\frac{2}{3}, \frac{3}{4}, \frac{5}{6}$. 12 is L.C.M. of denominators;

∴ fractions become $\frac{2\times4}{3\times4}, \frac{3\times3}{4\times3}, \frac{5\times2}{6\times2}$, or $\frac{8}{12}, \frac{9}{12}, \frac{10}{12}$.

(4) $\frac{2}{9}, \frac{5}{27}$. 27 is L.C.M. of denominators;

∴ fractions become $\frac{2\times3}{9\times3}, \frac{5}{27}$, or $\frac{6}{27}, \frac{5}{27}$.

(5) $\frac{3}{7}, \frac{5}{14}, \frac{11}{28}$. 28 is L.C.M. of denominators;

∴ fractions become $\frac{3\times4}{7\times4}, \frac{5\times2}{14\times2}, \frac{11}{28}$, or $\frac{12}{28}, \frac{10}{28}, \frac{11}{28}$.

(6) $\frac{1}{2}, \frac{3}{4}, \frac{5}{9}$. 36 is L.C.M. of denominators;

∴ fractions become $\frac{1\times18}{2\times18}, \frac{3\times9}{4\times9}, \frac{5\times4}{9\times4}$, or $\frac{18}{36}, \frac{27}{36}, \frac{20}{36}$.

(7) $\frac{7}{8}, \frac{11}{12}, \frac{17}{18}.$ 72 is L.C.M. of denominators;

∴ fractions become

$$\frac{7\times9}{8\times9}, \frac{11\times6}{12\times6}, \frac{17\times4}{18\times4}, \text{ or } \frac{63}{72}, \frac{66}{72}, \frac{68}{72}.$$

(8) $\frac{5}{12}, \frac{7}{16}, \frac{13}{24}.$ 48 is L.C.M. of denominators;

∴ fractions become

$$\frac{5\times4}{12\times4}, \frac{7\times3}{16\times3}, \frac{13\times2}{24\times2}, \text{ or } \frac{20}{48}, \frac{21}{48}, \frac{26}{48}.$$

(9) $\frac{5}{6}, \frac{9}{10}, \frac{14}{15}.$ 30 is L.C.M. of denominators;

∴ fractions become

$$\frac{5\times5}{6\times5}, \frac{9\times3}{10\times3}, \frac{14\times2}{15\times2}, \text{ or } \frac{25}{30}, \frac{27}{30}, \frac{28}{30}.$$

(10) $\frac{2}{5}, \frac{2}{3}, \frac{5}{9}, \frac{7}{10}.$ 90 is L.C.M. of denominators;

∴ fractions become

$$\frac{2\times18}{5\times18}, \frac{2\times30}{3\times30}, \frac{5\times10}{9\times10}, \frac{7\times9}{10\times9}, \text{ or } \frac{36}{90}, \frac{60}{90}, \frac{50}{90}, \frac{63}{90}.$$

(11) $\frac{2}{3}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}.$ 24 is L.C.M. of denominators;

∴ fractions become

$$\frac{2\times8}{3\times8}, \frac{3\times6}{4\times6}, \frac{5\times4}{6\times4}, \frac{7\times3}{8\times3}, \text{ or } \frac{16}{24}, \frac{18}{24}, \frac{20}{24}, \frac{21}{24}.$$

(12) $\frac{1}{7}, \frac{4}{11}, \frac{7}{13}, \frac{2}{3}.$ 3003 is L.C.M. of denominators;

∴ fractions become

$$\frac{1\times429}{7\times429}, \frac{4\times273}{11\times273}, \frac{7\times231}{13\times231}, \frac{2\times1001}{3\times1001}, \text{ or } \frac{429}{3003}, \frac{1092}{3003}, \frac{1617}{3003}, \frac{2002}{3003}.$$

(13) $\frac{3}{5}, \frac{35}{80}, \frac{14}{200}.$ 400 is L.C.M. of denominators;

∴ fractions become

$$\frac{3\times80}{5\times80}, \frac{35\times5}{80\times5}, \frac{14\times2}{200\times2}, \text{ or } \frac{240}{400}, \frac{175}{400}, \frac{28}{400}.$$

(14) $\frac{7}{12}, \frac{6}{7}, \frac{20}{63}, \frac{13}{84}$. 252 is L.C.M. of denominators;

∴ fractions become

$$\frac{7\times21}{12\times21}, \frac{6\times36}{7\times36}, \frac{20\times4}{63\times4}, \frac{13\times3}{84\times3}, \text{ or } \frac{147}{252}, \frac{216}{252}, \frac{80}{252}, \frac{39}{252}.$$

(15) $\frac{7}{9}, \frac{5}{11}, \frac{13}{18}, \frac{3}{22}, \frac{1}{36}$. 396 is L.C.M. of denominators;

∴ fractions become

$$\frac{7\times44}{9\times44}, \frac{5\times36}{11\times36}, \frac{13\times22}{18\times22}, \frac{3\times18}{22\times18}, \frac{1\times11}{36\times11},$$

$$\text{or } \frac{308}{396}, \frac{180}{396}, \frac{286}{396}, \frac{54}{396}, \frac{11}{396}.$$

(16) $\frac{1}{3}, \frac{7}{8}, \frac{5}{6}, \frac{9}{14}, \frac{3}{28}, \frac{17}{32}$. 672 is L.C.M. of denominators;

∴ fractions become

$$\frac{1\times224}{3\times224}, \frac{7\times84}{8\times84}, \frac{5\times112}{6\times112}, \frac{9\times48}{14\times48}, \frac{3\times24}{28\times24}, \frac{17\times21}{32\times21},$$

$$\text{or } \frac{224}{672}, \frac{588}{672}, \frac{560}{672}, \frac{432}{672}, \frac{72}{672}, \frac{357}{672}.$$

(17) $\frac{2}{3}, \frac{4}{9}, \frac{7}{27}, \frac{8}{81}, \frac{16}{243}, \frac{31}{729}$. 729 is L.C.M. of denominators;

∴ fractions become

$$\frac{2\times243}{3\times243}, \frac{4\times81}{9\times81}, \frac{7\times27}{27\times27}, \frac{8\times9}{81\times9}, \frac{16\times3}{243\times3}, \frac{31}{729},$$

$$\text{or } \frac{486}{729}, \frac{324}{729}, \frac{189}{729}, \frac{72}{729}, \frac{48}{729}, \frac{31}{729}.$$

(18) $\frac{9}{10}, \frac{9}{100}, \frac{9}{1000}, \frac{9}{10000}$. 10000 is L.C.M. of denominators;

∴ fractions become

$$\frac{9\times1000}{10\times1000}, \frac{9\times100}{100\times100}, \frac{9\times10}{1000\times10}, \frac{9}{10000},$$

$$\text{or } \frac{9000}{10000}, \frac{900}{10000}, \frac{90}{10000}, \frac{9}{10000}.$$

(19) $\frac{31}{60}, \frac{17}{90}, \frac{13}{25}, \frac{1}{105}, \frac{5}{9}$. 6300 is L. C. M. of denominators;

∴ fractions become

$$\frac{31\times105}{60\times105}, \frac{17\times70}{90\times70}, \frac{13\times252}{25\times252}, \frac{1\times60}{105\times60}, \frac{5\times700}{9\times700},$$

$$\text{or } \frac{3255}{6300}, \frac{1190}{6300}, \frac{3276}{6300}, \frac{60}{6300}, \frac{3500}{6300}.$$

(20) $\frac{31}{54}, \frac{11}{28}, \frac{53}{63}, \frac{3}{12}$. 756 is L. C. M. of denominators;

∴ fractions become

$$\frac{31\times14}{54\times14}, \frac{11\times27}{28\times27}, \frac{53\times12}{63\times12}, \frac{3\times63}{12\times63}, \text{ or } \frac{434}{756}, \frac{297}{756}, \frac{636}{756}, \frac{189}{756}.$$

Ex. XVIII. (p. 45.)

1. (1) $\frac{3}{5}, \frac{8}{9}, \frac{7}{10}$. 90 is L. C. M. of denominators;

∴ fractions become

$$\frac{3\times18}{5\times18}, \frac{8\times10}{9\times10}, \frac{7\times9}{10\times9}, \text{ or } \frac{54}{90}, \frac{80}{90}, \frac{63}{90};$$

∴ in order of magnitude the fractions stand thus,

$$\frac{8}{9}, \frac{7}{10}, \frac{3}{5}.$$

(2) $\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}$. 24 is L. C. M. of denominators;

∴ fractions become

$$\frac{1\times12}{2\times12}, \frac{3\times6}{4\times6}, \frac{5\times4}{6\times4}, \frac{7\times3}{8\times3}, \text{ or } \frac{12}{24}, \frac{18}{24}, \frac{20}{24}, \frac{21}{24};$$

∴ in order of magnitude the fractions stand thus,

$$\frac{7}{8}, \frac{5}{6}, \frac{3}{4}, \frac{1}{2}.$$

(3) $\frac{1}{5}$ of $\frac{3}{8}$, $\frac{7}{12}$, $\frac{4}{3}$ of $\frac{6}{7}$, or $\frac{3}{40}, \frac{7}{12}, \frac{8}{7}$. 840 is L.C.M. of dens;

∴ fractions become

$$\frac{3\times21}{40\times21}, \frac{7\times70}{12\times70}, \frac{8\times120}{7\times120}, \text{ or } \frac{63}{840}, \frac{490}{840}, \frac{960}{840};$$

∴ in order of magnitude the fractions stand thus,

$$\frac{4}{3} \text{ of } \frac{6}{7}, \frac{7}{12}, \frac{1}{5} \text{ of } \frac{3}{8}.$$

(4) $\frac{5}{12}, \frac{3}{16}, \frac{10}{21}, \frac{31}{60}.$ 1680 is L. C. M. of denominators;

∴ fractions become

$$\frac{5\times140}{12\times140}, \frac{3\times105}{16\times105}, \frac{10\times80}{21\times80}, \frac{31\times28}{60\times28}, \text{ or } \frac{700}{1680}, \frac{315}{1680}, \frac{800}{1680}, \frac{868}{1680};$$

∴ in order of magnitude the fractions stand thus,

$$\frac{31}{60}, \frac{10}{21}, \frac{5}{12}, \frac{3}{16}.$$

(5) $\frac{3}{7}, \frac{7}{13}, \frac{9}{22}, \frac{8}{11}, \frac{21}{26}.$ 2002 is L.C.M. of denominators;

∴ fractions become

$$\frac{3\times286}{7\times286}, \frac{7\times154}{13\times154}, \frac{9\times91}{22\times91}, \frac{8\times182}{11\times182}, \frac{21\times77}{26\times77}$$

$$\text{or } \frac{858}{2002}, \frac{1078}{2002}, \frac{819}{2002}, \frac{1456}{2002}, \frac{1617}{2002};$$

∴ in order of magnitude the fractions stand thus,

$$\frac{21}{26}, \frac{8}{11}, \frac{7}{13}, \frac{3}{7}, \frac{9}{22}.$$

(6) $\frac{3}{7}$ of $\frac{5}{8}$ of 4, $\frac{2}{11}$ of $\frac{3}{5}$ of 5, $\frac{1}{6}$ of $\frac{1}{2}$ of $4\frac{3}{4}$, $\frac{14}{28}$, or $\frac{15}{14}, \frac{6}{11}, \frac{19}{48}, \frac{1}{2}.$

3696 is L. C. M. of denominators; ∴ fractions become

$$\frac{15\times264}{14\times264}, \frac{6\times336}{11\times336}, \frac{19\times77}{48\times77}, \frac{1\times1848}{2\times1848}, \text{ or } \frac{3960}{3696}, \frac{2016}{3696}, \frac{1463}{3696}, \frac{1848}{3696};$$

∴ in order of magnitude the fractions stand thus,

$\frac{3}{7}$ of $\frac{5}{8}$ of 4, $\frac{2}{11}$ of $\frac{3}{5}$ of 5, $\frac{14}{28}$, $\frac{1}{6}$ of $\frac{1}{2}$ of $4\frac{3}{4}$.

(7) $\frac{3}{8}, \frac{27}{32}, \frac{9}{16}, \frac{7}{10}, \frac{27}{40}.$ 160 is L.C.M. of denominators;

∴ fractions become

$$\frac{3\times20}{8\times20}, \frac{27\times5}{32\times5}, \frac{9\times10}{16\times10}, \frac{7\times16}{10\times16}, \frac{27\times4}{40\times4},$$

$$\text{or } \frac{60}{160}, \frac{135}{160}, \frac{90}{160}, \frac{112}{160}, \frac{108}{160};$$

∴ in order of magnitude the fractions stand thus,

$$\frac{27}{32}, \frac{7}{10}, \frac{27}{40}, \frac{9}{16}, \frac{3}{8}.$$

(8) $\frac{15}{4}$, $3\frac{1}{3}$, $\frac{2}{7}$ of $9\frac{2}{5}$, or $\frac{15}{4}$, $\frac{10}{3}$, $\frac{94}{35}$.

420 is L. C. M. of denominators; ∴ fractions become

$$\frac{15\times105}{4\times105},\ \frac{10\times140}{3\times140},\ \frac{94\times12}{35\times12},\ \text{or}\ \frac{1575}{420},\ \frac{1400}{420},\ \frac{1128}{420};$$

∴ in order of magnitude the fractions stand thus,

$$\frac{15}{4},\ 3\tfrac{1}{3},\ \frac{2}{7}\text{ of }9\tfrac{2}{5}.$$

(9) $\frac{6}{7}$, $\frac{13}{28}$, $1\frac{4}{9}$, $\frac{5}{8}$, $\frac{29}{56}$, or $\frac{6}{7}$, $\frac{13}{28}$, $\frac{13}{9}$, $\frac{5}{8}$, $\frac{29}{56}$.

504 is L. C. M. of denominators; ∴ fractions become

$$\frac{6\times72}{7\times72},\ \frac{13\times18}{28\times18},\ \frac{13\times56}{9\times56},\ \frac{5\times63}{8\times63},\ \frac{29\times9}{56\times9},$$

$$\text{or}\ \frac{432}{504},\ \frac{234}{504},\ \frac{728}{504},\ \frac{315}{504},\ \frac{261}{504};$$

∴ in order of magnitude the fractions stand thus,

$$1\tfrac{4}{9},\ \frac{6}{7},\ \frac{5}{8},\ \frac{29}{56},\ \frac{13}{28}.$$

(10) $\frac{8}{9}$, $\frac{3}{11}$, $\frac{7}{18}$, $\frac{9}{22}$, $\frac{5}{36}$. 396 is L. C. M. of denominators;

∴ fractions become

$$\frac{8\times44}{9\times44},\ \frac{3\times36}{11\times36},\ \frac{7\times22}{18\times22},\ \frac{9\times18}{22\times18},\ \frac{5\times11}{36\times11},$$

$$\text{or}\ \frac{352}{396},\ \frac{108}{396},\ \frac{154}{396},\ \frac{162}{396},\ \frac{55}{396};$$

∴ in order of magnitude the fractions stand thus,

$$\frac{8}{9},\ \frac{9}{22},\ \frac{7}{18},\ \frac{3}{11},\ \frac{5}{36}.$$

(11) $\frac{51}{76}$, $\frac{113}{152}$, $1\frac{1}{38}$, $\frac{401}{448}$, $\frac{700}{748}$, or $\frac{51}{76}$, $\frac{113}{152}$, $\frac{39}{38}$, $\frac{401}{448}$, $\frac{700}{748}$.

1591744 is L. C. M. of denominators; ∴ fractions become

$$\frac{51\times20944}{76\times20944},\ \frac{113\times10472}{152\times10472},\ \frac{39\times41888}{38\times41888},\ \frac{401\times3553}{448\times3553},\ \frac{700\times2128}{748\times2128},$$

$$\text{or}\ \frac{1068144}{1591744},\ \frac{1183336}{1591744},\ \frac{1633632}{1591744},\ \frac{1424753}{1591744},\ \frac{1489600}{1591744};$$

∴ in order of magnitude the fractions stand thus,

$$1\tfrac{1}{38},\ \frac{700}{748},\ \frac{401}{448},\ \frac{113}{152},\ \frac{51}{76}.$$

(12) $\frac{15}{4}$, $3\frac{1}{3}$, $\frac{2}{7}$ of $9\frac{2}{5}$, $\frac{2}{7}$ of $\frac{5}{9}$ of $\frac{4}{5}$, or $\frac{15}{4}$, $\frac{10}{3}$, $\frac{94}{35}$, $\frac{8}{63}$.

1260 is L. C. M. of denominators; ∴ fractions become

$$\frac{15\times315}{4\times315},\ \frac{10\times420}{3\times420},\ \frac{94\times36}{35\times36},\ \frac{8\times20}{63\times20},$$

$$\text{or } \frac{4725}{1260},\ \frac{4200}{1260},\ \frac{3384}{1260},\ \frac{160}{1260},$$

∴ in order of magnitude the fractions stand thus,

$$\frac{15}{4},\ 3\tfrac{1}{3},\ \frac{2}{7} \text{ of } 9\tfrac{2}{5},\ \frac{2}{7} \text{ of } \frac{5}{9} \text{ of } \frac{4}{5}.$$

2. (1) $\frac{3}{4}$, $\frac{7}{12}$, $\frac{2}{3}$, $\frac{1}{6}$, and $\frac{1}{2}$. 12 is L. C. M. of denominators;

∴ the fractions become

$$\frac{3\times3}{4\times3},\ \frac{7}{12},\ \frac{2\times4}{3\times4},\ \frac{1\times2}{6\times2},\ \frac{1\times6}{2\times6},\ \text{ or } \frac{9}{12},\ \frac{7}{12},\ \frac{8}{12},\ \frac{2}{12},\ \frac{6}{12};$$

∴ $\frac{3}{4}$ is the greatest fraction and $\frac{1}{6}$ the least.

(2) $\frac{11}{12}$, $\frac{29}{30}$, $\frac{17}{18}$, $\frac{7}{16}$, $\frac{47}{48}$. 720 is L. C. M. of denominators;

∴ the fractions become

$$\frac{11\times60}{12\times60},\ \frac{29\times24}{30\times24},\ \frac{17\times40}{18\times40},\ \frac{7\times45}{16\times45},\ \frac{47\times15}{48\times15},$$

$$\text{or } \frac{660}{720},\ \frac{696}{720},\ \frac{680}{720},\ \frac{315}{720},\ \frac{705}{720};$$

∴ $\frac{47}{48}$ is the greatest fraction and $\frac{7}{16}$ the least.

ADDITION OF VULGAR FRACTIONS.

Ex. XIX. (p. 47.)

1. (1) $\frac{2}{3}+\frac{5}{7}=\frac{2\times7}{3\times7}+\frac{5\times3}{7\times3}=\frac{14}{21}+\frac{15}{21}=\frac{29}{21}=1\tfrac{8}{21}$.

(2) $\frac{2}{9}+\frac{4}{9}=\frac{6}{9}=\frac{2}{3}$.

(3) $\frac{5}{6}+\frac{7}{8}=\frac{5\times4}{6\times4}+\frac{7\times3}{8\times3}=\frac{20}{24}+\frac{21}{24}=\frac{41}{24}=1\frac{17}{24}$.

(4) $\frac{1}{7}+\frac{4}{21}=\frac{1\times3}{7\times3}+\frac{4}{21}=\frac{3}{21}+\frac{4}{21}=\frac{7}{21}=\frac{1}{3}$.

(5) $\frac{3}{16}+\frac{5}{64}=\frac{3\times4}{16\times4}+\frac{5}{64}=\frac{12}{64}+\frac{5}{64}=\frac{17}{64}$.

(6) $\frac{9}{14}+\frac{13}{21}=\frac{9\times3}{14\times3}+\frac{13\times2}{21\times2}=\frac{27}{42}+\frac{26}{42}=\frac{53}{42}=1\frac{11}{42}$.

(7) $\frac{5}{12}+\frac{7}{18}=\frac{5\times3}{12\times3}+\frac{7\times2}{18\times2}=\frac{15}{36}+\frac{14}{36}=\frac{29}{36}$.

(8) $\frac{3}{24}+\frac{21}{32}=\frac{1}{8}+\frac{21}{32}=\frac{1\times4}{8\times4}+\frac{21}{32}=\frac{4}{32}+\frac{21}{32}=\frac{25}{32}$.

(9) $\frac{3}{5}+2\frac{1}{6}=2+\frac{3}{5}+\frac{1}{6}=2+\frac{3\times6}{5\times6}+\frac{1\times5}{6\times5}=2+\frac{18}{30}+\frac{5}{30}=2\frac{23}{30}$.

(10) $\frac{5}{12}+\frac{7}{13}=\frac{5\times13}{12\times13}+\frac{7\times12}{13\times12}=\frac{65}{156}+\frac{84}{156}=\frac{149}{156}$.

(11) $3\frac{5}{8}+7\frac{2}{5}=10+\frac{5}{8}+\frac{2}{5}=10+\frac{5\times5}{8\times5}+\frac{2\times8}{5\times8}$

$$=10+\frac{25}{40}+\frac{16}{40}=10+\frac{41}{40}=10+1\frac{1}{40}=11\frac{1}{40}.$$

(12) $4\frac{3}{4}+9\frac{11}{12}=13+\frac{3}{4}+\frac{11}{12}=13+\frac{3\times3}{4\times3}+\frac{11}{12}=13+\frac{9}{12}+\frac{11}{12}$

$$=13+\frac{20}{12}=13+1\frac{8}{12}=14\frac{2}{3}.$$

2. (1) $\frac{2}{3}+\frac{5}{6}+\frac{7}{12}=\frac{2\times4}{3\times4}+\frac{5\times2}{6\times2}+\frac{7}{12}=\frac{8}{12}+\frac{10}{12}+\frac{7}{12}=\frac{25}{12}=2\frac{1}{12}$.

(2) $\frac{3}{5}+\frac{2}{7}+\frac{1}{3}=\frac{3\times7\times3}{5\times7\times3}+\frac{2\times5\times3}{7\times5\times3}+\frac{1\times5\times7}{3\times5\times7}$

$$=\frac{63}{105}+\frac{30}{105}+\frac{35}{105}=\frac{128}{105}=1\frac{23}{105}.$$

(3) $\frac{1}{2}+\frac{2}{5}+\frac{1}{10}=\frac{1\times5}{2\times5}+\frac{2\times2}{5\times2}+\frac{1}{10}=\frac{5}{10}+\frac{4}{10}+\frac{1}{10}=\frac{10}{10}=1$.

(4) $\frac{5}{12}+\frac{1}{8}+\frac{7}{24}=\frac{5\times2}{12\times2}+\frac{1\times3}{8\times3}+\frac{7}{24}=\frac{10}{24}+\frac{3}{24}+\frac{7}{24}=\frac{20}{24}=\frac{5}{6}$.

(5) $$\frac{2}{5}+\frac{3}{8}+\frac{7}{12}=\frac{2\times 24}{5\times 24}+\frac{3\times 15}{8\times 15}+\frac{7\times 10}{12\times 10}$$
$$=\frac{48}{120}+\frac{45}{120}+\frac{70}{120}=\frac{163}{120}=1\tfrac{43}{120}.$$

(6) $$\frac{3}{4}+\frac{4}{7}+\frac{7}{9}=\frac{3\times 7\times 9}{4\times 7\times 9}+\frac{4\times 4\times 9}{7\times 4\times 9}+\frac{7\times 4\times 7}{9\times 4\times 7}$$
$$=\frac{189}{252}+\frac{144}{252}+\frac{196}{252}=\frac{529}{252}=2\tfrac{25}{252}.$$

(7) $$\frac{1}{2}+\frac{5}{6}+\frac{3}{21}=\frac{1\times 21}{2\times 21}+\frac{5\times 7}{6\times 7}+\frac{3\times 2}{21\times 2}$$
$$=\frac{21}{42}+\frac{35}{42}+\frac{6}{42}=\frac{62}{42}=1\tfrac{20}{42}=1\tfrac{10}{21}.$$

(8) $$\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}=\frac{1\times 30}{2\times 30}+\frac{1\times 20}{3\times 20}+\frac{1\times 15}{4\times 15}+\frac{1\times 12}{5\times 12}$$
$$=\frac{30}{60}+\frac{20}{60}+\frac{15}{60}+\frac{12}{60}=\frac{77}{60}=1\tfrac{17}{60}.$$

(9) $$\frac{5}{7}+\frac{6}{45}+\frac{9}{35}=\frac{5\times 45}{7\times 45}+\frac{6\times 7}{45\times 7}+\frac{9\times 9}{35\times 9}$$
$$=\frac{225}{315}+\frac{42}{315}+\frac{81}{315}=\frac{348}{315}=1\tfrac{33}{315}=1\tfrac{11}{105}.$$

(10) $$\frac{3}{6}+2\tfrac{1}{7}+13\tfrac{3}{10}=15+\frac{1}{2}+\frac{1}{7}+\frac{3}{10}=15+\frac{1\times 35}{2\times 35}+\frac{1\times 10}{7\times 10}+\frac{3\times 7}{10\times 7}$$
$$=15+\frac{35}{70}+\frac{10}{70}+\frac{21}{70}=15+\frac{66}{70}=15\tfrac{33}{35}.$$

(11) $$\frac{3}{5}+\frac{4}{5}\text{ of }\frac{1}{3}+9\tfrac{3}{20}=9+\frac{3}{5}+\frac{4}{15}+\frac{3}{20}=9+\frac{3\times 12}{5\times 12}+\frac{4\times 4}{15\times 4}+\frac{3\times 3}{20\times 3}$$
$$=9+\frac{36}{60}+\frac{16}{60}+\frac{9}{60}=9+\frac{61}{60}=10\tfrac{1}{60}.$$

(12) $$\frac{1}{3}\text{ of }\frac{3}{4}\text{ of }\frac{4}{5}+5\tfrac{1}{2}+\frac{2}{19}=\frac{1}{5}+5\tfrac{1}{2}+\frac{2}{19}=5+\frac{1}{5}+\frac{1}{2}+\frac{2}{19}$$
$$=5+\frac{1\times 38}{190}+\frac{1\times 95}{190}+\frac{2\times 10}{190}=5+\frac{38}{190}+\frac{95}{190}+\frac{20}{190}=5+\frac{153}{190}=5\tfrac{153}{190}.$$

(13) $$\frac{7}{5}+\frac{4}{3}+\frac{1}{6}+\frac{11}{30}=\frac{7\times 6}{5\times 6}+\frac{4\times 10}{3\times 10}+\frac{1\times 5}{6\times 5}+\frac{11}{30}$$
$$=\frac{42}{30}+\frac{40}{30}+\frac{5}{30}+\frac{11}{30}=\frac{98}{30}=3\tfrac{4}{15}.$$

(14) $\frac{10}{14} + \frac{2}{15} + \frac{18}{70} = \frac{5}{7} + \frac{2}{15} + \frac{9}{35} = \frac{5 \times 15}{7 \times 15} + \frac{2 \times 7}{15 \times 7} + \frac{9 \times 3}{35 \times 3}$

$$= \frac{75}{105} + \frac{14}{105} + \frac{27}{105} = \frac{116}{105} = 1\tfrac{11}{105}.$$

(15) $\frac{4}{5} + \frac{7}{10} + \frac{4}{7} + \frac{2}{21} = \frac{4 \times 42}{5 \times 42} + \frac{7 \times 21}{10 \times 21} + \frac{4 \times 30}{7 \times 30} + \frac{2 \times 10}{21 \times 10}$

$$= \frac{168}{210} + \frac{147}{210} + \frac{120}{210} + \frac{20}{210} = \frac{455}{210} = 2\tfrac{35}{210} = 2\tfrac{1}{6}.$$

(16) $\frac{1}{8} + \frac{7}{12} + \frac{5}{9} + \frac{9}{20} = \frac{1 \times 45}{8 \times 45} + \frac{7 \times 30}{12 \times 30} + \frac{5 \times 40}{9 \times 40} + \frac{9 \times 18}{20 \times 18}$

$$= \frac{45}{360} + \frac{210}{360} + \frac{200}{360} + \frac{162}{360} = \frac{617}{360} = 1\tfrac{257}{360}.$$

(17) $\frac{1}{5} + 6\tfrac{4}{5} + \frac{4}{7}$ of $\frac{1}{3} = 6 + \frac{1}{5} + \frac{4}{5} + \frac{4}{21} = 6 + \frac{5}{5} + \frac{4}{21} = 6 + 1 + \frac{4}{21} = 7\tfrac{4}{21}.$

(18) $100\tfrac{2}{5} + 64\tfrac{5}{9} + \frac{3}{5}$ of $701 = 100 + 64 + 420 + \frac{2}{5} + \frac{5}{9} + \frac{3}{5}$

(since $\frac{3}{5}$ of $701 = \frac{2103}{5} = 420\tfrac{3}{5}$),

$$= 584 + \frac{5}{5} + \frac{5}{9} = 585\tfrac{5}{9}.$$

(19) $261\tfrac{1}{3} + 174\tfrac{3}{4} + \frac{5}{6}$ of $10\tfrac{1}{2} = 261 + 174 + 8 + \frac{1}{3} + \frac{3}{4} + \frac{3}{4}$

(since $\frac{5}{6}$ of $10\tfrac{1}{2} = \frac{5 \times 21}{6 \times 2} = \frac{35}{4} = 8\tfrac{3}{4}$),

$$= 443 + \frac{1}{3} + \frac{6}{4} = 443 + \frac{1}{3} + 1\tfrac{1}{2} = 444 + \frac{2}{6} + \frac{3}{6} = 444\tfrac{5}{6}.$$

(20) $387\tfrac{1}{2} + 285\tfrac{1}{4} + 394\tfrac{1}{3} + \frac{2}{5}$ of 3704

$$= 387 + 285 + 394 + 1481 + \frac{1}{2} + \frac{1}{4} + \frac{1}{3} + \frac{3}{5}$$

(since $\frac{2}{5}$ of $3704 = \frac{7408}{5} = 1481\tfrac{3}{5}$),

$$= 2547 + \frac{1 \times 30}{2 \times 30} + \frac{1 \times 15}{4 \times 15} + \frac{1 \times 20}{3 \times 20} + \frac{3 \times 12}{5 \times 12}$$

$$= 2547 + \frac{30}{60} + \frac{15}{60} + \frac{20}{60} + \frac{36}{60}$$

$$= 2547 + \frac{101}{60} = 2547 + 1\tfrac{41}{60} = 2548\tfrac{41}{60}.$$

3. (1) $$\frac{11}{10}+\frac{11}{100}+\frac{11}{1000}+\frac{11}{10000}=\frac{11\times1000}{10\times1000}+\frac{11\times100}{100\times100}+\frac{11\times10}{1000\times10}+\frac{11}{10000}$$
$$=\frac{11000+1100+110+11}{10000}=\frac{12221}{10000}=1\frac{2221}{10000}.$$

(2) $$\frac{11}{12}+\frac{17}{18}+\frac{29}{30}+\frac{47}{48}+\frac{59}{60}$$
$$=\frac{11\times60}{12\times60}+\frac{17\times40}{18\times40}+\frac{29\times24}{30\times24}+\frac{47\times15}{48\times15}+\frac{59\times12}{60\times12}$$
$$=\frac{660+680+696+705+708}{720}=\frac{3449}{720}=4\frac{569}{720}.$$

(3) $$\frac{1}{2}+\frac{1}{9}+\frac{3}{17}+\frac{29}{38}+\frac{33}{34}$$ (5814 is L.C.M. of denominators)
$$=\frac{1\times2907}{2\times2907}+\frac{1\times646}{9\times646}+\frac{3\times342}{17\times342}+\frac{29\times153}{38\times153}+\frac{33\times171}{34\times171}$$
$$=\frac{2907+646+1026+4437+5643}{5814}=\frac{14659}{5814}=2\frac{3031}{5814}.$$

(4) $$2\frac{11}{17}+6\frac{21}{34}+\frac{16}{51}+\frac{1}{3}\text{ of }\frac{16}{17}+\frac{29}{68}+\frac{1}{3}\text{ of }2\frac{3}{4}$$
$$=2+6+\frac{11}{17}+\frac{21}{34}+\frac{16}{51}+\frac{16}{51}+\frac{29}{68}+\frac{11}{12}$$
$$=8+\frac{11\times12}{17\times12}+\frac{21\times6}{34\times6}+\frac{32\times4}{51\times4}+\frac{29\times3}{68\times3}+\frac{11\times17}{12\times17}$$
$$=8+\frac{132+126+128+87+187}{204}=8+\frac{660}{204}=8+3\frac{48}{204}=11\frac{4}{17}.$$

(5) $$2\frac{2}{3}+3\frac{3}{4}+4\frac{4}{5}+5\frac{5}{6}+6\frac{6}{7}=2+3+4+5+6+\frac{2}{3}+\frac{3}{4}+\frac{4}{5}+\frac{5}{6}+\frac{6}{7}$$
$$=20+\frac{2\times140+3\times105+4\times84+5\times70+6\times60}{420}$$
$$=20+\frac{280+315+336+350+360}{420}$$
$$=20+\frac{1641}{420}=20+3\frac{381}{420}=23\frac{127}{140}.$$

(6) $$1\frac{4}{7}+3\frac{1}{10}+\frac{13}{15}+7\frac{5}{16}+\frac{9}{28}+\frac{2}{7}\text{ of }\frac{1}{5}=1+3+7+\frac{4}{7}+\frac{1}{10}+\frac{13}{15}+\frac{5}{16}+\frac{9}{28}+\frac{2}{35}$$
$$=11+\frac{4\times240+1\times168+13\times112+5\times105+9\times60+2\times48}{1680}$$
$$=11+\frac{960+168+1456+525+540+96}{1680}=11+\frac{3745}{1680}=11+2\frac{385}{1680}=13\frac{11}{48}.$$

(7) $5\frac{1}{6}+\frac{8}{9}$ of $\frac{6}{7}$ of $3\frac{1}{2}+9\frac{3}{10}+\frac{3}{7}$ of $\frac{5}{8}$ of $4=5+2+9+1+\frac{1}{6}+\frac{2}{3}+\frac{3}{10}+\frac{1}{14}$

$\left(\text{since } \frac{8}{9} \text{ of } \frac{6}{7} \text{ of } \frac{7}{2}=\frac{8}{3}=2\frac{2}{3}, \text{ and } \frac{3}{7} \text{ of } \frac{5}{8} \text{ of } 4=\frac{15}{14}=1\frac{1}{14}\right)$,

$=17+\frac{1\times 35+2\times 70+3\times 21+1\times 15}{210}=17+\frac{35+140+63+15}{210}$

$=17+\frac{253}{210}=17+1\frac{43}{210}=18\frac{43}{210}$.

(8) $\frac{5}{8}$ of $12+\frac{3}{5}$ of $\frac{8}{9}+3\frac{3}{8}$ of $1\frac{8}{9}$ of $\frac{14}{153}+\frac{13}{15}$ of $3\frac{3}{4}$ of $\frac{1}{81}$ of $1\frac{1}{26}$.

$=\frac{15}{2}+\frac{8}{15}+\frac{7}{12}+\frac{1}{24}=\frac{15\times 60+8\times 8+7\times 10+1\times 5}{120}$

$=\frac{900+64+70+5}{120}=\frac{1039}{120}=8\frac{79}{120}$.

(9) $270\frac{3}{4}+650\frac{3}{20}+5000\frac{1}{4}+53\frac{4}{5}+1\frac{1}{20}$

$=270+650+5000+53+1+\frac{3}{4}+\frac{3}{20}+\frac{1}{4}+\frac{4}{5}+\frac{1}{20}$

$=5974+\frac{15+3+5+16+1}{20}=5974+\frac{40}{20}=5974+2=5976$.

(10) $\frac{1}{2}$ of $\frac{3}{4}+\frac{7}{31}$ of $\left(1+\frac{15}{16}\right)+\frac{31}{32}+\frac{63}{64}$ of $\left(1+\frac{1}{2}\right)$

$=\frac{3}{8}+\frac{7}{31}$ of $\frac{31}{16}+\frac{31}{32}+\frac{63}{64}$ of $\frac{3}{2}=\frac{3}{8}+\frac{7}{16}+\frac{31}{32}+\frac{189}{128}$

$=\frac{3\times 16+7\times 8+31\times 4+189}{128}=\frac{48+56+124+189}{128}=\frac{417}{128}=3\frac{33}{128}$.

SUBTRACTION OF VULGAR FRACTIONS.

Ex. XX. (p. 49.)

1. (1) $\frac{3}{4}-\frac{1}{2}=\frac{3}{4}-\frac{1\times 2}{2\times 2}=\frac{3}{4}-\frac{2}{4}=\frac{1}{4}$.

(2) $\frac{5}{8}-\frac{1}{4}=\frac{5}{8}-\frac{1\times 2}{4\times 2}=\frac{5}{8}-\frac{2}{8}=\frac{3}{8}$.

(3) $\frac{4}{9}-\frac{3}{11}=\frac{4\times 11}{9\times 11}-\frac{3\times 9}{11\times 9}=\frac{44}{99}-\frac{27}{99}=\frac{17}{99}$.

(4) $\frac{7}{12}-\frac{8}{15}=\frac{7\times5}{12\times5}-\frac{8\times4}{15\times4}=\frac{35}{60}-\frac{32}{60}=\frac{3}{60}=\frac{1}{20}.$

(5) $\frac{17}{18}-\frac{11}{12}=\frac{17\times2}{18\times2}-\frac{11\times3}{12\times3}=\frac{34}{36}-\frac{33}{36}=\frac{1}{36}.$

(6) $\frac{8}{15}-\frac{9}{20}=\frac{8\times4}{15\times4}-\frac{9\times3}{20\times3}=\frac{32}{60}-\frac{27}{60}=\frac{5}{60}=\frac{1}{12}.$

(7) $2\frac{3}{5}-1\frac{1}{3}=(2-1)+\left(\frac{3}{5}-\frac{1}{3}\right)=1+\frac{3\times3}{5\times3}-\frac{1\times5}{3\times5}=1+\frac{9-5}{15}=1\frac{4}{15}.$

(8) $37\frac{4}{15}-33\frac{5}{24}=4+\frac{4}{15}-\frac{5}{24}=4+\frac{4\times8}{15\times8}-\frac{5\times5}{24\times5}=4+\frac{32-25}{120}=4\frac{7}{120}.$

(9) $6\frac{3}{8}-4\frac{1}{2}=\frac{51}{8}-\frac{9}{2}=\frac{51}{8}-\frac{9\times4}{2\times4}=\frac{51-36}{8}=\frac{15}{8}=1\frac{7}{8};$

or thus,

$$6\frac{3}{8}-4\frac{1}{2}=6+1+\frac{3}{8}-5\frac{1}{2}=6\frac{11}{8}-5\frac{1}{2}=1+\frac{11}{8}-\frac{1}{2}=1+\frac{11}{8}-\frac{4}{8}=1\frac{7}{8}.$$

(10) $13\frac{5}{12}-9\frac{7}{13}=13\frac{17}{12}-10\frac{7}{13}=3+\frac{17}{12}-\frac{7}{13}$

$$=3+\frac{17\times13}{12\times13}-\frac{7\times12}{13\times12}=3+\frac{221-84}{156}=3\frac{137}{156}.$$

(11) $50\frac{1}{16}-47\frac{1}{24}=3+\frac{1}{16}-\frac{1}{24}=3+\frac{1\times3}{16\times3}-\frac{1\times2}{24\times2}=3+\frac{3-2}{48}=3\frac{1}{48}.$

(12) $42-30\frac{5}{12}=42+1-31\frac{5}{12}=11+1-\frac{5}{12}=11+\frac{12}{12}-\frac{5}{12}=11\frac{7}{12}.$

(13) $15\frac{82}{729}-1\frac{16}{243}=15+1+\frac{82}{729}-2\frac{16}{243}$

$$=13+\frac{761}{729}-\frac{16}{243}=13+\frac{761}{729}-\frac{48}{729}=13\frac{713}{729}.$$

(14) $90\frac{10}{111}-25\frac{12}{125}=90+1+\frac{10}{111}-26\frac{12}{125}=64+\frac{121}{111}-\frac{12}{125}$

$$=64+\frac{121\times125}{111\times125}-\frac{12\times111}{111\times125}=64+\frac{15125-1332}{13875}=64\frac{13793}{13875}.$$

(15) $21-1\frac{179}{298}=21+1-2\frac{179}{298}=19+\frac{298}{298}-\frac{179}{298}=19+\frac{298-179}{298}=19\frac{119}{298}.$

(16) $125-\frac{2}{7}$ of $14=125-4=121.$

(17) $46\frac{5}{8}-15\frac{1}{6}=31+\frac{5}{8}-\frac{1}{6}=31+\frac{5\times3}{8\times3}-\frac{1\times4}{6\times4}=31+\frac{15-4}{24}=31\frac{11}{24}.$

(18) $\frac{13}{56}-\frac{5}{28}$ of $1\frac{1}{5}=\frac{13}{56}-\frac{3}{14}=\frac{13}{56}-\frac{3\times4}{14\times4}=\frac{13-12}{56}=\frac{1}{56}$.

(19) $\frac{1}{2}$ of $\frac{4}{5}$ of $\frac{3}{4}-\frac{2}{9}$ of $\frac{3}{4}=\frac{3}{10}-\frac{1}{6}=\frac{3\times3}{10\times3}-\frac{1\times5}{6\times5}=\frac{9-5}{30}=\frac{4}{30}=\frac{2}{15}$.

(20) $\frac{3}{7}$ of $\frac{2}{9}$ of $\frac{4}{5}$ of $8\frac{3}{4}-\frac{5}{8}$ of $\frac{4}{5}$ of $\frac{11}{18}$ of $1\frac{7}{11}$

$=\frac{2}{3}-\frac{1}{2}=\frac{2\times2}{3\times2}-\frac{1\times3}{2\times3}=\frac{4-3}{6}=\frac{1}{6}$.

2. $\frac{5}{8}$ of $\frac{4}{10}-\frac{7}{9}$ of $\frac{4}{21}=\frac{1}{4}-\frac{4}{27}=\frac{1\times27}{4\times27}-\frac{4\times4}{27\times4}=\frac{27-16}{108}=\frac{11}{108}$,

$\frac{5}{6}$ of $\frac{2}{15}-\frac{3}{8}$ of $\frac{4}{18}=\frac{1}{9}-\frac{1}{12}=\frac{1\times4}{9\times4}-\frac{1\times3}{12\times3}=\frac{4-3}{36}=\frac{1}{36}$;

∴ difference $=\frac{11}{108}-\frac{1}{36}=\frac{11}{108}-\frac{1\times3}{36\times3}=\frac{11-3}{108}=\frac{8}{108}=\frac{2}{27}$.

3. $\frac{8}{15}$ of $\frac{5}{6}+2\frac{7}{8}=\frac{4}{9}+2\frac{7}{8}=2+\frac{4\times8}{9\times8}+\frac{7\times9}{8\times9}=2+\frac{32+63}{72}=2+\frac{95}{72}$;

∴ required result $=2+\frac{95}{72}-\frac{5}{9}=2+\frac{95}{72}-\frac{5\times8}{9\times8}=2+\frac{95-40}{72}=2\frac{55}{72}$.

4. $11\frac{2}{3}+8\frac{7}{9}=19+\frac{2}{3}+\frac{7}{9}=19+\frac{6}{9}+\frac{7}{9}=19+\frac{13}{9}$;

∴ result $=19+\frac{13}{9}-9\frac{19}{22}=10+\frac{13\times22}{9\times22}-\frac{19\times9}{9\times22}=10+\frac{286-171}{198}=10\frac{115}{198}$.

5. Difference of two first fractions

$=5\frac{23}{32}-2\frac{2}{7}=3+\frac{23\times7}{32\times7}-\frac{2\times32}{7\times32}=3+\frac{161-64}{224}=3+\frac{97}{224}$.

Sum of

$\frac{5}{8}+\frac{5}{14}+\frac{1}{6}=\frac{5\times21}{8\times21}+\frac{5\times12}{14\times12}-\frac{1\times28}{6\times28}=\frac{105+60+28}{168}=\frac{193}{168}=1\frac{25}{168}$;

∴ result $=3\frac{97}{224}-1\frac{25}{168}=2+\frac{97}{224}-\frac{25}{168}=2+\frac{97\times3}{224\times3}-\frac{25\times4}{168\times4}$

$=2+\frac{291-100}{672}=2\frac{191}{672}$.

6. Sum of fractions $=1\frac{1}{26}+\frac{9}{13}=\frac{27}{26}+\frac{9}{13}=\frac{27+18}{26}=\frac{45}{26}$,

difference of fractions $=\frac{27-18}{26}=\frac{9}{26}$.

Now $\frac{45}{26}=\frac{9}{26}\times5$; ∴ sum = 5 times difference.

MULTIPLICATION OF VULGAR FRACTIONS.

Ex. XXI. (p. 52.)

1. (1) $\frac{5}{7}\times\frac{2}{3}=\frac{5\times2}{7\times3}=\frac{10}{21}$. (2) $\frac{8}{9}\times\frac{13}{15}=\frac{8\times13}{9\times15}=\frac{104}{135}$.

(3) $\frac{3}{4}\times\frac{8}{9}=\frac{3\times8}{4\times9}=\frac{3\times4\times2}{4\times3\times3}=\frac{2}{3}$.

(4) $\frac{5}{12}\times\frac{8}{15}=\frac{5\times8}{12\times15}=\frac{5\times4\times2}{4\times3\times3\times5}=\frac{2}{9}$.

(5) $\frac{51}{60}\times\frac{16}{17}=\frac{51\times16}{60\times17}=\frac{3\times17\times4\times4}{4\times3\times5\times17}=\frac{4}{5}$.

(6) $7\frac{1}{2}\times\frac{1}{3}=\frac{15\times1}{2\times3}=\frac{5\times3}{2\times3}=\frac{5}{2}=2\frac{1}{2}$.

(7) $3\frac{7}{9}\times2\frac{2}{3}=\frac{34\times8}{9\times3}=\frac{272}{27}=10\frac{2}{27}$.

(8) $7\frac{1}{2}\times\frac{1}{5}\text{ of }\frac{4}{9}=\frac{15\times1\times4}{2\times5\times9}=\frac{3\times5\times2\times2}{2\times5\times3\times3}=\frac{2}{3}$.

(9) $12\times\frac{2}{3}\text{ of }5=\frac{12\times2\times5}{3}=\frac{4\times3\times2\times5}{3}=40$.

(10) $\frac{1}{2}\text{ of }\frac{2}{3}\times5\frac{3}{8}\text{ of }3=\frac{1\times2\times43\times3}{2\times3\times8}=\frac{43}{8}=5\frac{3}{8}$.

(11) $\frac{12}{13}\text{ of }3\frac{2}{3}\times1\frac{1}{33}\text{ of }\frac{39}{51}\text{ of }\frac{3}{8}$

$$=\frac{12\times11\times34\times39\times3}{13\times3\times33\times51\times8}=\frac{4\times3\times11\times2\times17\times3\times13\times3}{13\times3\times3\times11\times3\times17\times4\times2}=1.$$

(12) $\frac{11}{15}\text{ of }1\frac{3}{22}\text{ of }\frac{1}{70}\times\frac{7}{12}\text{ of }37\frac{14}{35}\text{ of }3\frac{1}{8}\text{ of }\frac{1}{11}$

$$=\frac{11\times25\times1\times7\times1309\times25\times1}{15\times22\times70\times12\times35\times8\times11}$$

$$=\frac{11\times5\times5\times7\times11\times7\times17\times5\times5}{5\times3\times2\times11\times2\times5\times7\times12\times5\times7\times8\times11}$$

$$=\frac{17\times5}{3\times2\times2\times12\times8}=\frac{85}{1152}.$$

(13) $\frac{3}{8}$ of $2\frac{1}{16}$ of $1\frac{1}{63}$ of $3\frac{5}{87} \times \frac{3}{11}$ of $\frac{10}{19} = \frac{3 \times 33 \times 64 \times 266 \times 3 \times 10}{8 \times 16 \times 63 \times 87 \times 11 \times 19}$

$$= \frac{3 \times 3 \times 11 \times 8 \times 8 \times 2 \times 7 \times 19 \times 3 \times 2 \times 5}{8 \times 8 \times 2 \times 7 \times 3 \times 3 \times 3 \times 29 \times 11 \times 19} = \frac{10}{29}.$$

(14) $5\frac{2}{19}$ of $3\frac{1}{4}$ of $\frac{8}{117}$ of $34 \times \frac{3}{194}$ of $\frac{9}{68}$ of $1\frac{1}{3} \times 19$

$$= \frac{97 \times 13 \times 8 \times 34 \times 3 \times 9 \times 4 \times 19}{19 \times 4 \times 117 \times 194 \times 68 \times 3}$$

$$= \frac{97 \times 13 \times 4 \times 2 \times 2 \times 17 \times 3 \times 9 \times 2 \times 2 \times 19}{19 \times 2 \times 2 \times 9 \times 13 \times 2 \times 97 \times 4 \times 17 \times 3} = 2.$$

2. (1) $\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times \frac{5}{6} = \frac{1 \times 2 \times 3 \times 4 \times 5}{2 \times 3 \times 4 \times 5 \times 6} = \frac{1}{6}.$

(2) $\frac{15}{64} \times \frac{16}{27} \times \frac{11}{10} \times \frac{72}{385} \times \frac{21}{85} = \frac{15 \times 16 \times 11 \times 72 \times 21}{64 \times 27 \times 10 \times 385 \times 85}$

$$= \frac{5 \times 3 \times 16 \times 11 \times 4 \times 2 \times 9 \times 3 \times 7}{4 \times 16 \times 3 \times 9 \times 2 \times 5 \times 11 \times 5 \times 7 \times 5 \times 17} = \frac{3}{5 \times 5 \times 17} = \frac{3}{425}.$$

(3) $1\frac{17}{15} \times 2\frac{2}{3}$ of $1\frac{7}{37} \times \frac{33}{42} \times \frac{19}{328} \times 5\frac{1}{22}$ of $49 \times \frac{3}{76}$

$$= \frac{32 \times 8 \times 44 \times 33 \times 19 \times 111 \times 49 \times 3}{15 \times 3 \times 37 \times 42 \times 328 \times 22 \times 76}$$

$$= \frac{4 \times 8 \times 2 \times 2 \times 2 \times 11 \times 4 \times 3 \times 11 \times 19 \times 3 \times 37 \times 7 \times 7 \times 3}{5 \times 3 \times 3 \times 37 \times 2 \times 3 \times 7 \times 8 \times 41 \times 2 \times 11 \times 4 \times 19}$$

$$= \frac{2 \times 4 \times 11 \times 7}{5 \times 41} = \frac{616}{205} = 3\frac{1}{205}.$$

(4) $\frac{5}{6} \times 2\frac{3}{4} \times 3\frac{5}{11} \times 5\frac{2}{19} \times 6\frac{1}{194} = \frac{5 \times 11 \times 38 \times 97 \times 1165}{6 \times 4 \times 11 \times 19 \times 194}$

$$= \frac{5 \times 11 \times 2 \times 19 \times 97 \times 1165}{2 \times 3 \times 4 \times 11 \times 19 \times 2 \times 97} = \frac{5 \times 1165}{2 \times 3 \times 4} = \frac{5825}{24} = 242\frac{17}{24}.$$

(5) $\frac{95}{116} \times \frac{17}{21} \times \frac{87}{153} \times \frac{126}{190} \times \frac{4}{7}$ of $1\frac{2}{5} = \frac{95 \times 17 \times 87 \times 126 \times 4 \times 7}{116 \times 21 \times 153 \times 190 \times 7 \times 5}$

$$= \frac{5 \times 19 \times 17 \times 3 \times 29 \times 9 \times 2 \times 7 \times 4 \times 7}{4 \times 29 \times 3 \times 7 \times 9 \times 17 \times 19 \times 2 \times 5 \times 7 \times 5} = \frac{1}{5}.$$

(6) $\frac{147}{196} \times \frac{1764}{1491} \times \frac{355}{529} \times \frac{207}{507} \times 1\frac{110}{189} = \frac{147 \times 1764 \times 355 \times 207 \times 299}{196 \times 1491 \times 529 \times 507 \times 189}$

$$= \frac{49 \times 3 \times 4 \times 441 \times 5 \times 71 \times 9 \times 23 \times 13 \times 23}{49 \times 4 \times 7 \times 213 \times 23 \times 23 \times 13 \times 39 \times 9 \times 21} = \frac{3 \times 441 \times 5 \times 71}{7 \times 213 \times 39 \times 21}$$

$$= \frac{3 \times 3 \times 7 \times 21 \times 5 \times 71}{7 \times 3 \times 71 \times 3 \times 13 \times 21} = \frac{5}{13}.$$

DIVISION OF VULGAR FRACTIONS.

Ex. XXII. (p. 54.)

1. (1) $3 \div \frac{3}{4} = 3 \times \frac{4}{3} = \frac{3 \times 4}{3} = 4.$ (2) $\frac{5}{8} \div \frac{1}{4} = \frac{5}{8} \times \frac{4}{1} = \frac{5 \times 4}{4 \times 2} = \frac{5}{2} = 2\frac{1}{2}.$

(3) $\frac{8}{9} \div \frac{13}{18} = \frac{8}{9} \times \frac{18}{13} = \frac{8 \times 9 \times 2}{9 \times 13} = \frac{16}{13} = 1\frac{3}{13}.$

(4) $\frac{13}{20} \div \frac{3}{5} = \frac{13}{20} \times \frac{5}{3} = \frac{13 \times 5}{4 \times 5 \times 3} = \frac{13}{12} = 1\frac{1}{12}.$

(5) $\frac{51}{64} \div 3\frac{1}{6} = \frac{51}{64} \times \frac{6}{19} = \frac{51 \times 3 \times 2}{2 \times 32 \times 19} = \frac{51 \times 3}{32 \times 19} = \frac{153}{608}.$

(6) $\frac{16}{45} \div \frac{14}{15} = \frac{16}{45} \times \frac{15}{14} = \frac{2 \times 8 \times 15}{3 \times 15 \times 2 \times 7} = \frac{8}{3 \times 7} = \frac{8}{21}.$

(7) $2\frac{8}{21} \div 4\frac{1}{6} = \frac{50}{21} \times \frac{6}{25} = \frac{25 \times 2 \times 2 \times 3}{3 \times 7 \times 25} = \frac{4}{7}.$

(8) $\frac{69}{80} \div \frac{5}{8}$ of $3\frac{2}{7} = \frac{69}{80} \times \frac{8}{5} \times \frac{7}{23} = \frac{3 \times 23 \times 8 \times 7}{8 \times 10 \times 5 \times 23} = \frac{3 \times 7}{10 \times 5} = \frac{21}{50}.$

(9) $2\frac{1}{112} \div 6\frac{2}{7}$ of $2\frac{1}{2} = \frac{225}{112} \times \frac{7}{44} \times \frac{2}{5} = \frac{5 \times 45 \times 7 \times 2}{7 \times 2 \times 8 \times 4 \times 11 \times 5} = \frac{45}{352}.$

(10) $3\frac{3}{4}$ of $3\frac{1}{3}$ of $\frac{1}{2} \div 75 = \frac{15}{4} \times \frac{10}{3} \times \frac{1}{2} \times \frac{1}{75}$

$= \frac{15 \times 5 \times 2}{4 \times 3 \times 2 \times 5 \times 15} = \frac{1}{4 \times 3} = \frac{1}{12}.$

(11) $3\frac{1}{5}$ of $5\frac{5}{8}$ of $3\frac{5}{9} \div 9\frac{3}{4}$ of $\frac{8}{33}$ of $7\frac{1}{3} = \frac{16}{5} \times \frac{45}{8} \times \frac{32}{9} \times \frac{4}{39} \times \frac{33}{8} \times \frac{3}{22}$

$= \frac{4 \times 4 \times 5 \times 9 \times 4 \times 8 \times 4 \times 3 \times 11 \times 3}{5 \times 8 \times 9 \times 3 \times 13 \times 4 \times 2 \times 2 \times 11} = \frac{4 \times 4 \times 3}{13} = \frac{48}{13} = 3\frac{9}{13}.$

(12) $119 \div \frac{7}{9} = 119 \times \frac{9}{7} = \frac{7 \times 17 \times 9}{7} = 17 \times 9 = 153.$

(13) $\frac{3}{8}$ of $\frac{6}{7}$ of $80\frac{1}{9}$ of $9 \div \frac{3}{7}$ of $\frac{2}{9}$ of $\frac{4}{5}$ of $8\frac{3}{4}$

$= \frac{3}{8} \times \frac{6}{7} \times \frac{721}{9} \times \frac{9}{1} \times \frac{7}{3} \times \frac{9}{2} \times \frac{5}{4} \times \frac{4}{35}$

$= \frac{3 \times 2 \times 3 \times 7 \times 103 \times 9 \times 7 \times 9 \times 5 \times 4}{8 \times 7 \times 9 \times 3 \times 2 \times 4 \times 5 \times 7} = \frac{3 \times 103 \times 9}{8} = \frac{2781}{8} = 347\frac{5}{8}.$

(14) $\frac{5}{8}$ of $\frac{4}{5}$ of $\frac{11}{18}$ of $1\frac{7}{11} \div \frac{6}{17}$ of $\frac{95}{114}$ of $\frac{33}{44}$ of $1\frac{6}{11}$

$$= \frac{5}{8} \times \frac{4}{5} \times \frac{11}{18} \times \frac{18}{11} \times \frac{17}{6} \times \frac{114}{95} \times \frac{44}{33} \times \frac{11}{17} = \frac{4 \times 114 \times 44 \times 11}{8 \times 6 \times 95 \times 33}$$

(striking out common factors);

$$= \frac{4 \times 2 \times 3 \times 19 \times 2 \times 2 \times 11 \times 11}{4 \times 2 \times 3 \times 2 \times 5 \times 19 \times 3 \times 11} = \frac{2 \times 11}{5 \times 3} = \frac{22}{15} = 1\tfrac{7}{15}.$$

2. Product of $2\frac{1}{2}$ and $3\frac{7}{8} = \frac{5}{2} \times \frac{31}{8} = \frac{155}{16}$;

quotient of $2\frac{1}{2}$ by $3\frac{7}{8} = \frac{5}{2} \times \frac{8}{31} = \frac{20}{31}$;

therefore, comparing the fractions $\frac{155}{16}$ and $\frac{20}{31}$, they become

$$\frac{155 \times 31}{16 \times 31} \text{ and } \frac{20 \times 16}{31 \times 16}, \text{ or } \frac{4805}{496} \text{ and } \frac{320}{496}.$$

3. (1) $$\frac{\frac{3}{4}}{1\frac{7}{8}} = \frac{\frac{3}{4}}{\frac{15}{8}} = \frac{3}{4} \times \frac{8}{15} = \frac{3 \times 4 \times 2}{4 \times 3 \times 5} = \frac{2}{5}.$$

(2) $$\frac{\frac{14}{27}}{2\frac{1}{3}} = \frac{\frac{14}{27}}{\frac{7}{3}} = \frac{14}{27} \times \frac{3}{7} = \frac{7 \times 2 \times 3}{9 \times 3 \times 7} = \frac{2}{9}.$$

(3) $$\frac{2\frac{11}{12}}{\frac{5}{9}} = \frac{\frac{35}{12}}{\frac{5}{9}} = \frac{35}{12} \times \frac{9}{5} = \frac{5 \times 7 \times 3 \times 3}{3 \times 4 \times 5} = \frac{7 \times 3}{4} = \frac{21}{4} = 5\tfrac{1}{4}.$$

(4) $$\frac{\frac{6}{11}}{\frac{10}{99}} = \frac{6}{11} \times \frac{99}{10} = \frac{2 \times 3 \times 11 \times 9}{11 \times 2 \times 5} = \frac{27}{5} = 5\tfrac{2}{5}.$$

(5) $$\frac{13\frac{1}{3}}{20} = \frac{\frac{40}{3}}{\frac{20}{1}} = \frac{40}{3} \times \frac{1}{20} = \frac{20 \times 2}{3 \times 20} = \frac{2}{3}.$$

(6) $\dfrac{56}{1\frac{5}{9}} = \dfrac{\frac{56}{1}}{\frac{14}{9}} = \dfrac{56}{1} \times \dfrac{9}{14} = \dfrac{4 \times 14 \times 9}{14} = 36.$

(7) $\dfrac{13\frac{9}{10}}{1\frac{11}{14}} = \dfrac{\frac{139}{10}}{\frac{25}{14}} = \dfrac{139}{10} \times \dfrac{14}{25} = \dfrac{139 \times 2 \times 7}{2 \times 5 \times 25} = \dfrac{139 \times 7}{5 \times 25} = \dfrac{973}{125} = 7\frac{98}{125}.$

MISCELLANEOUS EXAMPLES IN FRACTIONS.

Ex. XXIII. (p. 58.)

I.

2. $\dfrac{2\frac{1}{2}}{5}$ of $7\frac{3}{4} = \dfrac{\frac{5}{2}}{\frac{5}{1}}$ of $\dfrac{31}{4} = \dfrac{5}{2} \times \dfrac{1}{5} \times \dfrac{31}{4} = \dfrac{31}{8}$, $1\frac{3}{4} \div 2\frac{1}{8} = \dfrac{7}{4} \div \dfrac{17}{8} = \dfrac{7}{4} \times \dfrac{8}{17} = \dfrac{14}{17}$;

$\therefore$ sum $= \dfrac{31}{8} + \dfrac{14}{17} = \dfrac{31 \times 17 + 14 \times 8}{8 \times 17} = \dfrac{527 + 112}{136} = \dfrac{639}{136} = 4\frac{95}{136}$,

difference $= \dfrac{527 - 112}{136} = \dfrac{415}{136} = 3\frac{7}{136}$.

Also sum of $5\frac{1}{8} + \dfrac{2}{3}$ of $3\frac{1}{2} + \dfrac{3}{4} \div \dfrac{6}{7}$

$= 5\frac{1}{8} + 2\frac{1}{3} + \dfrac{7}{8} = 7 + \dfrac{1}{8} + \dfrac{1}{3} + \dfrac{7}{8} = 7 + \dfrac{8}{8} + \dfrac{1}{3} = 8\frac{1}{3}.$

3. (1) $\left(\dfrac{3}{4} + \dfrac{7}{6} \text{ of } 5\frac{1}{2}\right) \times \left(\dfrac{5}{6} + \dfrac{2}{3} + 3\frac{3}{4}\right) = \left(\dfrac{3}{4} + \dfrac{7}{6} \times \dfrac{11}{2}\right) \times \left(3 + \dfrac{5}{6} + \dfrac{2}{3} + \dfrac{3}{4}\right)$

$= \left(\dfrac{9}{12} + \dfrac{77}{12}\right) \times \left(3 + \dfrac{10}{12} + \dfrac{8}{12} + \dfrac{9}{12}\right) = \dfrac{86}{12} \times 3\frac{27}{12} = \dfrac{43}{6} \times 3\frac{9}{4}$

$= \dfrac{43}{6} \times \dfrac{21}{4} = \dfrac{43 \times 3 \times 7}{2 \times 3 \times 4} = \dfrac{301}{8} = 37\frac{5}{8}.$

(2) $3\frac{1}{125}$ of $3\frac{4}{7} \div \dfrac{47}{345}$ of $9 = \dfrac{376}{125}$ of $\dfrac{25}{7} \times \dfrac{345}{47 \times 9}$

$= \dfrac{8 \times 47}{5 \times 25} \times \dfrac{25}{7} \times \dfrac{5 \times 3 \times 23}{47 \times 3 \times 3} = \dfrac{8 \times 23}{7 \times 3} = \dfrac{184}{21} = 8\frac{16}{21}.$

(3) $$\frac{3\frac{3}{4}}{4\frac{2}{7}}-\frac{3\frac{2}{5}}{4\frac{1}{4}}+\frac{\frac{4}{7}}{2\frac{1}{2}}=\frac{\frac{15}{4}}{\frac{30}{7}}-\frac{\frac{17}{5}}{\frac{17}{4}}+\frac{\frac{4}{7}}{\frac{5}{2}}=\frac{15\times7}{4\times30}-\frac{17\times4}{5\times17}+\frac{4\times2}{7\times5}=\frac{7}{8}-\frac{4}{5}-\frac{8}{35}$$

$$=\frac{7\times35-4\times7\times8+8\times8}{8\times35}=\frac{245-224+64}{280}=\frac{85}{280}=\frac{17}{56}.$$

(4) $$\frac{4\frac{1}{3}\times4\frac{1}{3}\times4\frac{1}{3}-1}{4\frac{1}{3}\times4\frac{1}{3}-1}=\frac{\frac{13}{3}\times\frac{13}{3}\times\frac{13}{3}-1}{\frac{13}{3}\times\frac{13}{3}-1}=\frac{\frac{2197}{27}-1}{\frac{169}{9}-1}=\frac{\frac{2197-27}{27}}{\frac{169-9}{9}}$$

$$=\frac{2170}{27}\times\frac{9}{160}=\frac{217\times9}{9\times3\times16}=\frac{217}{48}=4\tfrac{25}{48}.$$

(5) $$3+\frac{1}{7+\frac{1}{16}}=3+\frac{1}{\frac{112+1}{16}}=3+\frac{16}{113}=\frac{339+16}{113}=\frac{355}{113}=3\tfrac{16}{113}.$$

4. $$\frac{2+4+6}{3+5+7}=\frac{12}{15}=\frac{4}{5}.$$

Now $\frac{2}{3}$, $\frac{4}{5}$, $\frac{6}{7}$, are equivalent to $\frac{70}{105}$, $\frac{84}{105}$, $\frac{90}{105}$;

$\therefore \frac{2+4+6}{3+5+7}$ does lie between the greatest and least of the fractions $\frac{2}{3}$, $\frac{4}{5}$, $\frac{6}{7}$, since $\frac{2}{3}$ is the least, and $\frac{6}{7}$ the greatest.

5. By the question, the smaller number

$$=20\tfrac{11}{15}-15\tfrac{4}{35}=5+\frac{11\times7-4\times3}{105}=5+\frac{77-12}{105}=5\tfrac{65}{105}=5\tfrac{13}{21}.$$

II.

2. By the question, the number $=41\frac{1}{4}-19\frac{1}{2}=21\frac{3}{4}$.

By the question,

$$\text{number}=3\tfrac{1}{2}\text{ of }\frac{4}{5}\div2\tfrac{4}{10}\text{ of }\frac{4}{13}=\frac{7}{2}\times\frac{4}{5}\div\frac{24}{10}\text{ of }\frac{4}{13}=\frac{7}{2}\times\frac{4}{5}\times\frac{10}{24}\times\frac{13}{4}$$

$$=\frac{7\times4\times2\times5\times13}{2\times5\times24\times4}=\frac{91}{24}=3\tfrac{19}{24}.$$

3. $$\frac{93208}{13786}=\frac{93208\div122}{13786\div122}=\frac{764}{113};\quad\frac{95469}{359784}=\frac{95469\div789}{359784\div789}=\frac{121}{456}.$$

4. (1) $$\frac{2\frac{1}{2}}{3\frac{1}{4}}+\frac{1\frac{1}{2}-\frac{5}{6}}{1\frac{1}{4}+\frac{5}{6}}-1\tfrac{2}{39}=\frac{\frac{5}{2}}{\frac{13}{4}}+\frac{\frac{3}{2}-\frac{5}{6}}{\frac{5}{4}+\frac{5}{6}}-\frac{41}{39}=\frac{5}{2}\times\frac{4}{13}+\frac{4}{6}\times\frac{12}{25}-\frac{41}{39}$$

$$=\frac{10}{13}+\frac{8}{25}-\frac{41}{39}=\frac{10\times3\times25+8\times39-41\times25}{25\times39}$$

$$=\frac{750+312-1025}{975}=\frac{37}{975}.$$

(2) $$3\tfrac{2}{5}\text{ of }5\tfrac{1}{2}\text{ of }\frac{7}{9}-\frac{1}{3}\text{ of }\frac{5}{12}=\frac{17\times11\times7}{5\times2\times9}-\frac{5}{3\times12}=\frac{1309}{90}-\frac{5}{36}$$

$$=\frac{2618-25}{180}=\frac{2593}{180}=14\tfrac{73}{180}.$$

(3) $$\left(\frac{2}{19}+\frac{1}{13}\right)\div\left(3-\frac{1}{3}\right)\times\left(\frac{1}{3}+\frac{1}{5}\right)=\frac{26+19}{19\times13}\div\frac{8}{3}\times\frac{8}{15}$$

$$=\frac{45}{19\times13}\times\frac{3}{8}\times\frac{8}{15}=\frac{9}{247}.$$

(4) $$\frac{3}{14}\text{ of }\frac{4\frac{5}{9}}{6\frac{1}{6}}\text{ of }\frac{6\frac{8}{11}}{11\frac{5}{7}}=\frac{3}{14}\text{ of }\frac{41}{9}\times\frac{6}{37}\text{ of }\frac{74}{11}\times\frac{7}{82}$$

$$=\frac{3\times41\times2\times3\times2\times37\times7}{2\times7\times3\times3\times37\times11\times2\times41}=\frac{1}{11}.$$

5. Product of $2\tfrac{2}{15}$ and $2\tfrac{5}{8}=\frac{32}{15}\times\frac{21}{8}=\frac{4\times7}{5}$;

Difference of $2\tfrac{3}{5}$ and $2\tfrac{1}{4}=\frac{3}{5}-\frac{1}{4}=\frac{12}{20}-\frac{5}{20}=\frac{7}{20}$;

$\therefore$ quotient $=\frac{4\times7}{5}\div\frac{7}{20}=\frac{4\times7\times20}{5\times7}=16.$

III.

2. (1) $$275\tfrac{1}{3}+62\tfrac{11}{120}+1031\tfrac{1}{5}+\frac{7}{8}\text{ of }4150\tfrac{1}{7}$$

$$=275+62+1031+3631+\frac{1}{3}+\frac{11}{120}+\frac{1}{5}+\frac{3}{8}$$

$$=4999+\frac{40+11+24+45}{120}=4999+\frac{120}{120}=4999+1=5000.$$

(2) $$\frac{32}{51}\div\frac{112}{85}\times\frac{189}{207}\div1\tfrac{13}{23}=\frac{32\times85\times189\times23}{51\times112\times207\times36}$$

$$=\frac{4\times8\times5\times17\times9\times3\times7\times23}{3\times17\times8\times2\times7\times9\times23\times4\times9}=\frac{5}{18}.$$

(3) $$\frac{1}{3\frac{1}{5}} - \frac{2\frac{1}{4}}{9} + \frac{3\frac{5}{8}}{2} + \frac{\frac{4}{7}}{4\frac{4}{7}} = \frac{5}{16} - \frac{9}{36} + \frac{29}{16} + \frac{4}{32} = \frac{5}{16} - \frac{1}{4} + \frac{29}{16} + \frac{2}{16}$$

$$= \frac{5-4+29+2}{16} = \frac{32}{16} = 2.$$

(4) $$\frac{4\frac{1}{4}-3\frac{3}{8}}{4\frac{1}{4}+3\frac{3}{8}} + \frac{3-2\frac{1}{3}}{4-3\frac{1}{4}} = \frac{\frac{7}{8}}{7\frac{5}{8}} + \frac{\frac{2}{3}}{\frac{3}{4}} = \frac{7}{8} \times \frac{8}{61} + \frac{2}{3} \times \frac{4}{3} = \frac{7}{61} + \frac{8}{9}$$

$$= \frac{63+488}{549} = \frac{551}{549} = 1\tfrac{2}{549}.$$

3. $\frac{1}{3}$ of $4 = \frac{4}{3}$, and $\frac{1}{4}$ of $5 = \frac{5}{4}$.

Now $\frac{4}{3}$ and $\frac{5}{4}$ are equivalent to $\frac{16}{12}$ and $\frac{15}{12}$;

$\therefore$ $\frac{1}{3}$ of 4 is the greater by $\frac{1}{12}$.

4. Sum of fractions $\frac{3}{7} + \frac{4}{13} = \frac{39+28}{91} = \frac{67}{91}$,

product of $\frac{9}{11}$ and $\frac{13}{14} = \frac{9 \times 13}{11 \times 14}$; $\therefore$ quotient in lowest terms

$$= \frac{67}{91} \times \frac{11 \times 14}{9 \times 13} = \frac{67 \times 11 \times 7 \times 2}{7 \times 13 \times 9 \times 13} = \frac{67 \times 11 \times 2}{13 \times 9 \times 13} = \frac{1474}{1521}.$$

5. By the question, number $= 1\tfrac{8}{63} + \left(\frac{8}{9} - \frac{3}{7}\right) - \frac{2}{15} \div 2\tfrac{1}{2}$

$$= \frac{71}{63} + \frac{29}{63} - \frac{4}{75} = \frac{100}{63} - \frac{4}{75} = \frac{2500-84}{1575} = \frac{2416}{1575} = 1\tfrac{841}{1575}.$$

IV.

1. $\frac{4}{7}$ of $\frac{1}{2} + 1\frac{1}{9} = \frac{2}{7} + \frac{10}{9} = \frac{18+70}{63} = \frac{88}{63}$.

Difference of $\frac{4}{11}$ and $\frac{1}{5} = \frac{20-11}{55} = \frac{9}{55}$;

$\therefore$ product $= \frac{88}{63} \times \frac{9}{55} = \frac{8 \times 11 \times 9}{9 \times 7 \times 5 \times 11} = \frac{8}{35}$.

2. (1) $\frac{3}{4}\times\frac{7}{11}\times 8\frac{1}{5}\div\frac{2}{5}\left(7\frac{3}{4}+\frac{5}{2}\right)=\frac{3}{4}\times\frac{7}{11}\times\frac{41}{5}\div\frac{2}{5}$ of $7\frac{13}{4}$

$$=\frac{3}{4}\times\frac{7}{11}\times\frac{41}{5}\div\frac{2}{5}\text{ of }\frac{41}{4}=\frac{3\times 7\times 41\times 5\times 4}{4\times 11\times 5\times 2\times 41}=\frac{3\times 7}{11\times 2}=\frac{21}{22}.$$

(2) $\frac{1}{8}-\frac{1}{12}+\frac{1}{15}-\frac{1}{20}=\frac{15-10+8-6}{120}=\frac{23-16}{120}=\frac{7}{120}.$

(3) $\frac{27968}{37376}=\frac{27968\div 64}{37376\div 64}=\frac{437}{584}.$

(4) $\frac{1}{13}$ of $(1+5\frac{1}{2})+\frac{5}{6}$ of $\frac{1}{27}$ of $(7-2\frac{2}{5})-\frac{1}{3}$

$$=\frac{1}{13}\text{ of }6\frac{1}{2}+\frac{5}{6}\text{ of }\frac{1}{27}\text{ of }4\frac{3}{5}-\frac{1}{3}=\frac{1}{13}\times\frac{13}{2}+\frac{5}{6}\times\frac{1}{27}\times\frac{23}{5}-\frac{1}{3}$$

$$=\frac{1}{2}+\frac{23}{162}-\frac{1}{3}=\frac{81+23-54}{162}=\frac{50}{162}=\frac{25}{81}.$$

(5) $$\frac{\frac{10}{3}+\frac{5}{6}-\frac{20}{21}}{\frac{5}{6}-\frac{4}{7}}=\frac{\frac{140+35-40}{42}}{\frac{35-24}{42}}=\frac{135}{11}=12\frac{3}{11}.$$

3. Number $=3\frac{1}{4}-\frac{3}{4}$ of $\left(\frac{1}{3}+\frac{1}{5}-\frac{4}{15}+\frac{1}{9}\right)=\frac{13}{4}-\frac{3}{4}$ of $\left(\frac{15+9-12+5}{45}\right)$

$$=\frac{13}{4}-\frac{3}{4}\times\frac{17}{45}=\frac{13}{4}-\frac{17}{60}=\frac{195-17}{60}=\frac{178}{60}=2\frac{58}{60};$$

and number $=\frac{64}{315}\times\frac{1}{4}\times\frac{1}{6}\times\frac{1}{8}=\frac{1}{315\times 3}=\frac{1}{945}.$

4. After paying away $\frac{1}{3}$ of my money, $\frac{2}{3}$ remains;

after paying away $\frac{1}{2}$ of $\frac{2}{3}$ of my money, $\frac{2}{3}-\frac{1}{2}$ of $\frac{2}{3}$, or, $\frac{1}{3}$ remains;

after paying away $\frac{1}{4}$ of $\frac{1}{3}$ of my money, $\frac{1}{3}-\frac{1}{12}$, or, $\frac{1}{4}$ remains.

5. Sum of fractions $=5\frac{1}{3}+5\frac{1}{4}=10\frac{7}{12}$, difference of fractions $=5\frac{1}{3}-5\frac{1}{4}=\frac{1}{12}$;

$\therefore$ product $=10\frac{7}{12}\times\frac{1}{12}=\frac{127}{144}$, quotient $=10\frac{7}{12}\div\frac{1}{12}=127$;

$\therefore$ quotient is 144 times as great as product.

V.

1. $\dfrac{2+3}{4+5} \div \dfrac{4+3\frac{1}{2}}{5+5\frac{1}{2}} = \dfrac{5}{9} \div \dfrac{7\frac{1}{2}}{10\frac{1}{2}} = \dfrac{5}{9} \div \dfrac{15}{21} = \dfrac{5}{9} \times \dfrac{7}{5} = \dfrac{7}{9}$.

Sum of $\dfrac{1}{2}$, $1\frac{3}{7}$, and $\dfrac{5}{6}$

$$= 1 + \frac{1}{2} + \frac{3}{7} + \frac{5}{6} = 1 + \frac{21+18+35}{42} = 1 + \frac{74}{42} = 1 + \frac{37}{21} = \frac{58}{21},$$

difference of $\dfrac{4}{15}$ and $\dfrac{3}{20} = \dfrac{16-9}{60} = \dfrac{7}{60}$; $\therefore$ product $= \dfrac{58}{21} \times \dfrac{7}{60} = \dfrac{29}{90}$;

$\therefore$ quotient $= \dfrac{29}{90} \div \dfrac{11}{18}$ of $1\frac{14}{15} = \dfrac{29}{90} \times \dfrac{18}{11} \times \dfrac{15}{29} = \dfrac{3}{11}$.

2. (1) $\left(\dfrac{5}{2} - \dfrac{2}{5}\right) \div \left(\dfrac{4}{3} - \dfrac{3}{4}\right) = \dfrac{25-4}{10} \div \dfrac{16-9}{12} = \dfrac{21}{10} \times \dfrac{12}{7} = \dfrac{3 \times 6}{5} = \dfrac{18}{5} = 3\frac{3}{5}$.

(2) $$\frac{\frac{41}{162} - \frac{9}{49} - \frac{3}{54}}{\frac{4}{9} + \frac{1}{2} - \frac{13}{14}} = \frac{\frac{41}{162} - \frac{9}{49} - \frac{9}{162}}{\frac{4}{9} + \frac{7}{14} - \frac{13}{14}} = \frac{\frac{32}{162} - \frac{9}{49}}{\frac{4}{9} - \frac{6}{14}} = \frac{\frac{16}{81} - \frac{9}{49}}{\frac{4}{9} - \frac{3}{7}} = \frac{\frac{784-729}{81 \times 49}}{\frac{28-27}{9 \times 7}}$$

$$= \frac{55 \times 9 \times 7}{81 \times 49} = \frac{55}{9 \times 7} = \frac{55}{63}.$$

(3) $\dfrac{2}{5}$ of $\dfrac{13}{16} - \dfrac{1\frac{2}{3}}{6\frac{2}{3}}$ of $\dfrac{19}{20} + \dfrac{3}{7}$ of $\dfrac{6\frac{5}{12}}{3\frac{2}{3}}$

$$= \frac{13}{40} - \frac{1}{4} \text{ of } \frac{19}{20} + \frac{3}{7} \text{ of } \frac{7}{4} = \frac{13}{40} - \frac{19}{80} + \frac{3}{4} = \frac{26-19+60}{80} = \frac{67}{80}.$$

(4) $$\frac{\frac{3}{5}}{\frac{8}{9}} + \frac{\frac{5}{8}}{2\frac{1}{2} \times 1\frac{1}{3}} \times \frac{1}{80} = \frac{3}{5} \times \frac{9}{8} + \frac{5}{8} \times \frac{2}{5} \times \frac{3}{4} \times \frac{1}{80}$$

$$= \frac{27}{40} + \frac{3}{1280} = \frac{864+3}{1280} = \frac{867}{1280}.$$

(5) $$2\tfrac{1}{2} \times \frac{1}{3\frac{1}{3} + \frac{1}{4\frac{1}{4}}} = \frac{5}{2} \times \frac{1}{\frac{10}{3} + \frac{4}{17}} = \frac{5}{2} \times \frac{3 \times 17}{170+12} = \frac{5 \times 3 \times 17}{2 \times 182} = \frac{255}{364}.$$

(6) $\dfrac{\frac{5}{7}\text{ of }\frac{3}{10}+\frac{1}{4}\text{ of }\frac{8}{21}}{\frac{2}{3}\text{ of }\frac{9}{14}-\frac{5}{6}\text{ of }\frac{2}{15}}=\dfrac{\frac{3}{14}+\frac{2}{21}}{\frac{3}{7}-\frac{1}{9}}=\dfrac{\frac{9+4}{42}}{\frac{27-7}{63}}=\frac{13}{42}\times\frac{63}{20}=\frac{13\times3}{2\times20}=\frac{39}{40}.$

(7) $\dfrac{11\frac{5}{7}-7\frac{5}{11}}{3\frac{1}{2}+5\frac{5}{22}}=\dfrac{4\frac{20}{77}}{8\frac{16}{22}}=\frac{328}{77}\times\frac{22}{192}=\frac{8\times41\times2\times11}{7\times11\times8\times2\times12}=\frac{41}{84}.$

3. Sum of $\frac{3}{4}$, $\frac{7}{6}$ and $\frac{29}{12}=\frac{9}{12}+\frac{14}{12}+\frac{29}{12}=\frac{52}{12}=4\frac{1}{3}$;

$\therefore\ \frac{2}{3}$ is the fraction required.

4. $\frac{3}{8}$, $\frac{5}{12}$, $\frac{4}{9}$, $\frac{7}{20}$, are equivalent to $\frac{135}{360}$, $\frac{150}{360}$, $\frac{160}{360}$, $\frac{126}{360}$;

$\therefore$ sum of the greatest and least $=\frac{286}{360}$, sum of the other two $=\frac{285}{360}$;

$\therefore$ difference $=\frac{1}{360}$.

5. The man gives away $\frac{1}{2}$ of $\frac{3}{8}$ or $\frac{3}{16}$; $\therefore$ he has left $\frac{3}{8}-\frac{3}{16}=\frac{6}{16}-\frac{3}{16}=\frac{3}{16}$.

VI.

2. (1) $\frac{4}{5}\text{ of }\frac{1}{2}-\frac{2}{3}\text{ of }\frac{9}{17}+\frac{3}{5}\text{ of }1\frac{10}{17}=\frac{2}{5}-\frac{18}{51}+\frac{81}{85}$

$$=\frac{2\times51-18\times5+81\times3}{255}=\frac{102-90+243}{255}=\frac{255}{255}=1.$$

(2) $\dfrac{2\frac{3}{4}+3\frac{2}{5}}{4\frac{1}{5}+5\frac{1}{4}}+\dfrac{3\frac{2}{3}}{10\frac{1}{2}}=\dfrac{5\frac{23}{20}}{9\frac{9}{20}}+\dfrac{3\frac{2}{3}}{10\frac{1}{2}}$

$$=\frac{123}{189}+\frac{11\times2}{21\times3}=\frac{41}{63}+\frac{22}{63}=\frac{63}{63}=1.$$

(3) $\left\{\frac{5}{7}\times\frac{2}{9}\times13\frac{1}{2}\right\}\div\left\{\frac{1}{9}\times\frac{3}{7}+40\right\}$

$$=\left\{\frac{5\times2\times27}{7\times9\times2}\right\}\div\left\{\frac{1+840}{21}\right\}=\frac{15}{7}\times\frac{21}{841}=\frac{45}{841}.$$

(4) $\dfrac{2\frac{4}{11}}{2\frac{3}{5}}\div\dfrac{2\frac{7}{11}}{8\frac{7}{10}}=\left(\frac{26}{11}\times\frac{5}{13}\right)\div\left(\frac{29}{11}\times\frac{10}{87}\right)=\frac{2\times5}{11}\times\frac{11\times3}{10}=3.$

3. $\frac{2}{3}$ of $\frac{5}{9}$ of $\frac{81}{141}$ of $1\frac{1}{5} = \frac{2\times5\times9\times3\times3\times2\times3}{3\times9\times3\times47\times5} = \frac{2\times2\times3}{47} = \frac{12}{47}$.

5. $3\frac{1}{9}\times3\frac{1}{10} = \frac{28}{9}\times\frac{31}{10} = \frac{14\times31}{9\times5} = \frac{434}{45}$; $\frac{20\frac{3}{4}}{3}\div\frac{41\frac{1}{2}}{4} = \frac{83}{12}\times\frac{8}{83} = \frac{2}{3}$;

$\therefore$ sum of fractions $= \frac{434}{45} + \frac{30}{45} = \frac{464}{45}$,

difference of fractions $= \frac{434}{45} - \frac{30}{45} = \frac{404}{45}$,

difference of these results $= \frac{60}{45} = \frac{4}{3} = 1\frac{1}{3}$.

6. Number $= 3\frac{227}{420} - \frac{31}{35} - \frac{10}{21} = \frac{1487}{420} - \frac{372}{420} - \frac{200}{420} = \frac{915}{420} = \frac{61}{28} = 2\frac{5}{28}$,

and number $= \frac{4}{15}\times2\frac{1}{16} = \frac{4}{15}\times\frac{33}{16} = \frac{11}{20}$.

VII.

2. (1) $$\frac{\frac{3}{4}}{\frac{5}{4}} + \frac{2\frac{1}{4}-\frac{3}{7}}{5\frac{1}{4}+\frac{1}{14}} - \frac{2}{3\frac{4}{7}} = \frac{3}{5} + \frac{1\frac{23}{28}}{5\frac{9}{28}} - \frac{2\times7}{25} = \frac{3}{5} + \frac{51}{149} - \frac{14}{25}$$

$$= \frac{15}{25} + \frac{51}{149} - \frac{14}{25} = \frac{1}{25} + \frac{51}{149} = \frac{149+1275}{3725} = \frac{1424}{3725}.$$

(2) $$2\frac{1}{6} + 3\frac{3}{8} + \frac{9}{14} + \frac{1}{15} + 6\frac{17}{20} = 11 + \frac{1}{6} + \frac{3}{8} + \frac{9}{14} + \frac{1}{15} + \frac{17}{20}$$

$$= 11 + \frac{10}{60} + \frac{21}{56} + \frac{36}{56} + \frac{4}{60} + \frac{51}{60} = 11 + \frac{65}{60} + \frac{57}{56}$$

$$= 13 + \frac{1}{12} + \frac{1}{56} = 13 + \frac{14+3}{168} = 13\frac{17}{168}.$$

(3) $$\left(3\frac{1}{4} \text{ of } 4\frac{1}{3}\right) \div \left(2\frac{1}{2} - \frac{1}{3}\right) \text{of} \left(3\frac{1}{2} - \frac{1}{4}\right)$$

$$= \frac{13}{4}\times\frac{13}{3} \div 2\frac{1}{6} \text{ of } 3\frac{1}{4} = \frac{13\times13}{4\times3}\times\frac{6}{13}\times\frac{4}{13} = \frac{6}{3} = 2.$$

$$(4)\ \left(\frac{1}{26}\text{ of }3\tfrac{1}{4}\right)+\left(\frac{3}{8}\div\frac{27}{64}\right)-\left(\frac{1}{1\frac{1}{7}}-\frac{1\frac{1}{3}}{3}\right)\div\left(2-\frac{5}{9}\right)$$

$$=\frac{1}{8}+\frac{8}{9}-\left(\frac{7}{8}-\frac{4}{9}\right)\div\frac{13}{9}=\frac{1}{8}+\frac{8}{9}-\frac{63-32}{8\times 9}\times\frac{9}{13}$$

$$=\frac{1}{8}+\frac{8}{9}-\frac{31}{8\times 13}=\frac{9\times 13+8\times 8\times 13-31\times 9}{9\times 8\times 13}$$

$$=\frac{117+832-279}{936}=\frac{770}{936}=\frac{385}{468}.$$

3. $$\frac{\frac{2}{3}\text{ of }\frac{5}{7}\text{ of }\frac{35}{9}}{\frac{1}{7}\text{ of }\frac{2}{3}\text{ of }\frac{84}{81}}=\frac{2\times 5\times 5}{3\times 9}\times\frac{7\times 3\times 9\times 9}{2\times 2\times 7\times 6}=\frac{5\times 5\times 9}{2\times 6}=\frac{75}{4},$$

sum of $10\tfrac{3}{4}+3\tfrac{9}{10}+7\tfrac{24}{25}$

$$=20+\frac{75}{100}+\frac{90}{100}+\frac{96}{100}=20+\frac{261}{100}=\frac{2261}{100};$$

$\therefore$ difference required $=\dfrac{2261}{100}-\dfrac{75}{4}=\dfrac{2261-1875}{100}=\dfrac{386}{100}=3\tfrac{43}{50}.$

4. $$\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}=\frac{30+20+15+12}{60}=\frac{77}{60},\ 2-\frac{77}{60}=\frac{120-77}{60}=\frac{43}{60},$$

$$\frac{43}{60}\times\frac{2}{3}\text{ of }\frac{27}{40}\text{ of }8=\frac{43\times 2\times 3\times 3\times 3\times 8}{3\times 2\times 10\times 3\times 8\times 5}=\frac{129}{50};$$

$\therefore$ fraction required $=\dfrac{\frac{129}{50}}{\frac{99}{1}}=\dfrac{129}{50\times 99}=\dfrac{43}{1650}.$

5. Whole no. $-\left(\dfrac{1}{8}+\dfrac{2}{10}+\dfrac{3}{20}\right)$ of no. $=126$;

$\therefore$ whole no. $-\dfrac{19}{40}$ of no. $=126$;

$\therefore\ \dfrac{21}{40}$ of no. $=126$; $\therefore\ \dfrac{1}{40}$ of no. $=6$; $\therefore$ no. $=240$;

therefore, one obtained 30; two others, each 24; three others, each 12. Also by question, 21 no. scored by last $=126$; therefore, no. scored by him $=6$; therefore, no. scored by the remaining four, each $=30$.

DECIMALS.

Ex. XXIV. (p. 64.)

1. $\frac{1}{10}$; $\frac{3}{10}$; $\frac{31}{100}$; $\frac{311}{1000}$; $\frac{31111}{100000}$; $\frac{31111111}{100000000}$.

2. $\cdot 5 = \frac{5}{10} = \frac{1}{2}$; $\cdot 25 = \frac{25}{100} = \frac{1}{4}$; $\cdot 35 = \frac{35}{100} = \frac{7}{20}$; $\cdot 05 = \frac{5}{100} = \frac{1}{20}$;

$\cdot 005 = \frac{5}{1000} = \frac{1}{200}$; $\cdot 256 = \frac{256}{1000} = \frac{32}{125}$; $\cdot 0256 = \frac{256}{10000} = \frac{16}{625}$;

$\cdot 000256 = \frac{256}{1000000} = \frac{4}{15625}$; $\cdot 00008125 = \frac{8125}{100000000} = \frac{13}{160000}$.

3. $\cdot 075 = \frac{75}{1000} = \frac{15}{200} = \frac{3}{40}$; $\cdot 848 = \frac{848}{1000} = \frac{212}{250} = \frac{106}{125}$;

$3\cdot 02 = \frac{302}{100} = \frac{151}{50}$; $3\cdot 434 = \frac{3434}{1000} = \frac{1717}{500}$; $343\cdot 4 = \frac{3434}{10} = \frac{1717}{5}$;

$\cdot 03434 = \frac{3434}{100000} = \frac{1717}{50000}$; $\cdot 050005 = \frac{50005}{1000000} = \frac{10001}{200000}$;

$230\cdot 409 = \frac{230409}{1000}$; $2\cdot 30409 = \frac{230409}{100000}$; $2137\cdot 2 = \frac{21372}{10} = \frac{10686}{5}$;

$91300\cdot 0008 = \frac{913000008}{10000} = \frac{456500004}{5000} = \frac{114125001}{1250}$;

$24\cdot 000625 = \frac{24000625}{1000000} = \frac{4800125}{200000} = \frac{960025}{40000} = \frac{192005}{8000} = \frac{38401}{1600}$;

$8213\cdot 7169125 = \frac{82137169125}{10000000} = \frac{16427433825}{2000000} = \frac{3285486765}{400000} = \frac{657097353}{80000}$;

$\cdot 00083276 = \frac{83276}{100000000} = \frac{20819}{25000000}$;

$1\cdot 0000009 = \frac{10000009}{10000000}$; $\cdot 000000001 = \frac{1}{1000000000}$.

4. ·1; ·3; ·7; ·53; ·07; ·003; ·9178; 91·78; ·09178; ·0091; ·00009; 520·3; ·9; 3·0142; 6·72819; ·000672819; 6728·19.

5. $\cdot 7 \times 10 = \frac{7}{10} \times 10 = 7$; $\cdot 7 \times 100 = \frac{7}{10} \times 100 = 70$;

$\cdot 7 \times 1000 = \frac{7}{10} \times 1000 = 700$; $\cdot 7 \times 100000 = \frac{7}{10} \times 100000 = 70000$;

$$\cdot006\times100=\frac{6}{1000}\times100=\frac{6}{10}=\cdot6\;;\quad\cdot006\times10000=\frac{6}{1000}\times10000=60\;;$$

$$\cdot006\times10000000=\frac{6}{1000}\times10000000=60000\;;$$

$$\cdot0431\times100=\frac{431}{10000}\times100=\frac{431}{100}=4\cdot31\;;$$

$$\cdot0431\times1000000=\frac{431}{10000}\times1000000=43100\;;$$

$$16\cdot201\times10=\frac{16201}{1000}\times10=162\cdot01\;;$$

$$16\cdot201\times1000=\frac{16201}{1000}\times1000=16201\;;$$

$$16\cdot201\times1000000=\frac{16201}{1000}\times1000000=16201000\;;$$

$$9\cdot0016\times1000000=\frac{90016}{10000}\times1000000=9001600\;;$$

$$9\cdot0016\times100=\frac{90016}{10000}\times100=900\cdot16.$$

6. $$\cdot51\div10=\frac{51}{100}\times\frac{1}{10}=\frac{51}{1000}=\cdot051\;;$$

$$\cdot51\div1000=\frac{51}{100}\times\frac{1}{1000}=\frac{51}{100000}=\cdot00051\;;$$

$$\cdot51\div100000=\frac{51}{100}\times\frac{1}{100000}=\frac{51}{10000000}=\cdot0000051\;;$$

$$\cdot008\div100=\frac{8}{1000}\times\frac{1}{100}=\frac{8}{100000}=\cdot00008\;;$$

$$\cdot008\div1000000=\frac{8}{1000}\times\frac{1}{1000000}=\frac{8}{1000000000}=\cdot000000008\;;$$

$$5\cdot016\div1000=\frac{5016}{1000}\times\frac{1}{1000}=\frac{5016}{1000000}=\cdot005016\;;$$

$$5\cdot016\div100000=\frac{5016}{1000}\times\frac{1}{100000}=\frac{5016}{100000000}=\cdot00005016\;;$$

$$378\cdot0186\div1000=\frac{3780186}{10000}\times\frac{1}{1000}=\frac{3780186}{10000000}=\cdot3780186\;;$$

$$378\cdot0186\div1000000=\frac{3780186}{10000}\times\frac{1}{1000000}=\frac{3780186}{10000000000}=\cdot0003780186\;;$$

7. ·5; ·7; ·19; ·28; ·005; 9·7; ·000001; 14·4; 280·0004; 7·007; 100·00001; 1·0010001; ·000000000005.

8. Four-tenths; twenty-five hundredths; seventy-five hundredths; seven hundred and forty-five thousandths; one-tenth; one thousandth; one hundred thousandth; twenty-three and seventy-five hundredths; two and three hundred and seventy-five thousandths; two thousand three hundred and seventy-five ten thousandths; two thousand three hundred and seventy-five hundred millionths; one and one millionth; one million and one ten millionths; one hundred millionth.

ADDITION OF DECIMALS.

Ex. XXV. (p. 66.)

1. (1)
·234
14·3812
·01
32·47
·00075
47·09595

(2)
232·15
3·225
21·
·0001
34·005
·001304
290·381404

(3)
14·94
·00857
1·5
5607·25
530·
·0057
6153·70427

2. (1)
·08
165·
1·327
·0003
2760·1
9·
2935·5073

(2)
346·
·0027
·25
·186
72·505
·0014
·00004
418·94514

(3)
6·3084
·006
36·207
·0001
364·
·008022
406·529522

(4)
725·1201
34·00076
·04
50·9
143·713
953·77386

(5)
67·8125
27·105
17·5
·000375
255·
3·0125
370·430375

3. (1)
2·0068
·04137
·987641
1·0000009
57·
1·5
62·5358119

$$2\cdot0068+\cdot04137+\cdot987641+1\cdot0000009+57+1\cdot5$$

$$=\frac{20068}{10000}+\frac{4137}{100000}+\frac{987641}{1000000}+\frac{10000009}{10000000}+\frac{57}{1}+\frac{15}{10}$$

$$=\frac{20068000}{10000000}+\frac{413700}{10000000}+\frac{9876410}{10000000}+\frac{10000009}{10000000}+\frac{570000000}{10000000}+\frac{15000000}{10000000}$$

$$=\frac{625358119}{10000000}=62\cdot5358119.$$

(2)

$$\begin{array}{r@{\cdot}l}
 & 0003025 \\
29 & 99987 \\
143 & 2 \\
5 & 000025 \\
9000 & \\
3 & 4073 \\
\hline
9181 & 6074975
\end{array}$$

$$\cdot0003025+29\cdot99987+143\cdot2+5\cdot000025+9000+3\cdot4073$$

$$=\frac{3025}{10000000}+\frac{2999987}{100000}+\frac{1432}{10}+\frac{5000025}{1000000}+\frac{9000}{1}+\frac{34073}{10000}$$

$$=\frac{3025}{10000000}+\frac{299998700}{10000000}+\frac{1432000000}{10000000}+\frac{50000250}{10000000}+\frac{90000000000}{10000000}+\frac{34073000}{10000000}$$

$$=\frac{91816074975}{10000000}=9181\cdot6074975.$$

(3)

$$\begin{array}{r@{\cdot}l}
21 & 74 \\
 & 075 \\
103 & 00375 \\
 & 0005495 \\
4957 & 5 \\
\hline
5082 & 3192995
\end{array}$$

$$21\cdot74+\cdot075+103\cdot00375+\cdot0005495+4957\cdot5$$

$$=\frac{2174}{100}+\frac{75}{1000}+\frac{10300375}{100000}+\frac{5495}{10000000}+\frac{49575}{10}$$

$$=\frac{217400000}{10000000}+\frac{750000}{10000000}+\frac{1030037500}{10000000}+\frac{5495}{10000000}+\frac{49575000000}{10000000}$$

$$=\frac{50823192995}{10000000}$$

$$=5082\cdot3192995.$$

(4)

$$\begin{array}{r@{\cdot}l}
500 & 09 \\
375 & \\
20084 & 00078 \\
11002000 & 000209 \\
 & 000000011 \\
1000000000000 & 000000000001 \\
\hline
1000011022959 & 090989011001
\end{array}$$

SUBTRACTION OF DECIMALS.

Ex. XXVI. (p. 67.)

1. $\begin{array}{r}2{\cdot}1354\\1{\cdot}0436\\\hline 1{\cdot}0918\end{array}$ $\begin{array}{r}7{\cdot}835\\2{\cdot}0005\\\hline 5{\cdot}8345\end{array}$ $\begin{array}{r}156{\cdot}7\\15{\cdot}67\\\hline 141{\cdot}03\end{array}$ $\begin{array}{r}{\cdot}001\\{\cdot}0009\\\hline {\cdot}0001\end{array}$ $\begin{array}{r}{\cdot}305\\{\cdot}000683\\\hline {\cdot}304317\end{array}$

2. (1) $\begin{array}{r}213{\cdot}5\\1{\cdot}8125\\\hline 211{\cdot}6875\end{array}$ (2) $\begin{array}{r}{\cdot}0516\\{\cdot}0094187\\\hline {\cdot}0421813\end{array}$ (3) $\begin{array}{r}603{\cdot}\\{\cdot}6584003\\\hline 602{\cdot}3415997\end{array}$

(4) $\begin{array}{r}17{\cdot}5\\13{\cdot}0046\\\hline 4{\cdot}4954\end{array}$ (5) $\begin{array}{r}{\cdot}582\\{\cdot}09647\\\hline {\cdot}48553\end{array}$ (6) $\begin{array}{r}9{\cdot}233\\{\cdot}0536\\\hline 9{\cdot}1794\end{array}$

3. $\begin{array}{r}{\cdot}1\\{\cdot}01\\\hline {\cdot}09\end{array}$ or $${\cdot}1-{\cdot}01=\frac{1}{10}-\frac{1}{100}$$
$$=\frac{9}{100}={\cdot}09$$

$\begin{array}{r}713{\cdot}00683\\57{\cdot}704\\\hline 655{\cdot}30283\end{array}$ or $$713{\cdot}00683-57{\cdot}704$$
$$=\frac{71300683}{100000}-\frac{57704}{1000}$$
$$=\frac{71300683-5770400}{100000}$$
$$=\frac{65530283}{100000}=655{\cdot}30283$$

$\begin{array}{r}56{\cdot}078\\35{\cdot}009876\\\hline 21{\cdot}068124\end{array}$ or $$\frac{56078}{1000}-\frac{35009876}{1000000}=\frac{56078000-35009876}{1000000}$$
$$=\frac{21068124}{1000000}=21{\cdot}068124$$

$\begin{array}{r}9816{\cdot}\\27{\cdot}148\\\hline 9788{\cdot}852\end{array}$ or $$9816-\frac{27148}{1000}=\frac{9816000-27148}{1000}$$
$$=\frac{9788852}{1000}=9788{\cdot}852.$$

4. $\begin{array}{r}7{\cdot}\\{\cdot}7\\\hline 6{\cdot}3\end{array}$ or $$7-\frac{7}{10}=\frac{70-7}{10}=\frac{63}{10}=6{\cdot}3.$$

$$\begin{array}{r} \cdot7 \\ \cdot000007 \\ \hline \cdot699993 \end{array} \qquad \text{or} \quad \frac{7}{10}-\frac{7}{1000000}=\frac{700000-7}{1000000}=\frac{699993}{1000000}=\cdot699993.$$

$$\begin{array}{r} 174\cdot01 \\ 74\cdot304 \\ \hline 99\cdot706 \end{array} \qquad \text{or} \quad \frac{17401}{100}-\frac{74304}{1000}=\frac{174010-74304}{1000}=\frac{99706}{1000}=99\cdot706.$$

MULTIPLICATION OF DECIMALS.

Ex. XXVII. (p. 68.)

1. (1)

$$\begin{array}{r} 3\cdot8 \\ 42 \\ \hline 76 \\ 152 \\ \hline 159\cdot6 \end{array} \qquad \begin{array}{r} \cdot38 \\ \cdot42 \\ \hline 76 \\ 152 \\ \hline \cdot1596 \end{array} \qquad \begin{array}{r} 3\cdot8 \\ 4\cdot2 \\ \hline 76 \\ 152 \\ \hline 15\cdot96 \end{array} \qquad \begin{array}{r} \cdot038 \\ \cdot0042 \\ \hline 76 \\ 152 \\ \hline \cdot0001596 \end{array}$$

(2)

$$\begin{array}{r} 417 \\ \cdot417 \\ \hline 2919 \\ 417 \\ 1668 \\ \hline 173\cdot889 \end{array} \qquad \begin{array}{r} \cdot417 \\ \cdot417 \\ \hline \cdot173889 \end{array} \qquad \begin{array}{r} 71956 \\ \cdot000025 \\ \hline 359780 \\ 143912 \\ \hline 1\cdot798900 \end{array}$$

(3)

$$\begin{array}{r} 2\cdot052 \\ \cdot0031 \\ \hline 2052 \\ 6156 \\ \hline \cdot0063612 \end{array} \qquad \begin{array}{r} \cdot916 \\ 4\cdot07 \\ \hline 6412 \\ 3664 \\ \hline 3\cdot72812 \end{array} \qquad \begin{array}{r} 476 \\ \cdot00026 \\ \hline 2856 \\ 952 \\ \hline \cdot12376 \end{array}$$

2. (1)

$$\begin{array}{r} 81\cdot4632 \\ \cdot0378 \\ \hline 6517056 \\ 5702424 \\ 2443896 \\ \hline 3\cdot07930896 \end{array} \qquad \text{or} \quad 81\cdot4632\times\cdot0378 = \frac{814632}{10000}\times\frac{378}{10000} = \frac{307930896}{100000000}=3\cdot07930896.$$

(2)

$$\begin{array}{r} 27\cdot35 \\ 7\cdot70071 \\ \hline 2735 \\ 19145 \\ 19145 \\ 19145 \\ \hline 210\cdot6144185 \end{array} \qquad \text{or} \quad 27\cdot35\times7\cdot70071 = \frac{2735}{100}\times\frac{770071}{100000} = \frac{2106144185}{10000000}=210\cdot6144185.$$

(3)
$$\begin{array}{r} \cdot04375 \\ \cdot0754 \\ \hline 17500 \\ 21875 \\ 30625 \\ \hline \cdot003298750 \end{array}$$

or $\cdot04375 \times \cdot0754$

$$= \frac{4375}{100000} \times \frac{754}{10000}$$

$$= \frac{3298750}{1000000000} = \cdot00329875.$$

3. (1)
$$\begin{array}{r} \cdot0046 \\ 7\cdot85 \\ \hline 230 \\ 368 \\ 322 \\ \hline \cdot036110 \end{array}$$

or $\cdot0046 \times 7\cdot85$

$$= \frac{46}{10000} \times \frac{785}{100}$$

$$= \frac{36110}{1000000} = \cdot03611.$$

(2)
$$\begin{array}{r} \cdot00846 \\ \cdot00324 \\ \hline 3384 \\ 1692 \\ 2538 \\ \hline \cdot0000274104 \end{array}$$

or $\cdot00846 \times \cdot00324$

$$= \frac{846}{100000} \times \frac{324}{100000}$$

$$= \frac{274104}{10000000000} = \cdot0000274104.$$

(3)
$$\begin{array}{r} \cdot314 \\ \cdot0021 \\ \hline 314 \\ 628 \\ \hline \cdot0006594 \end{array}$$

or $\cdot314 \times \cdot0021$

$$= \frac{314}{1000} \times \frac{21}{10000}$$

$$= \frac{6594}{10000000} = \cdot0006594.$$

(4)
$$\begin{array}{r} \cdot009 \\ \cdot00846 \\ \hline 54 \\ 36 \\ 72 \\ \hline \cdot00007614 \end{array}$$

or $\cdot009 \times \cdot00846$

$$= \frac{9}{1000} \times \frac{846}{100000}$$

$$= \frac{7614}{100000000} = \cdot00007614.$$

(5)
$$\begin{array}{r} \cdot009207 \\ 6\cdot056 \\ \hline 55242 \\ 46035 \\ 55242 \\ \hline \cdot055757592 \end{array}$$

or $\cdot009207 \times 6\cdot056$

$$= \frac{9207}{1000000} \times \frac{6056}{1000}$$

$$= \frac{55757592}{1000000000} = \cdot055757592.$$

(6)
$$\begin{array}{r} \cdot00948 \\ 29 \\ \hline 8532 \\ 1896 \\ \hline \cdot27492 \end{array}$$

or $\cdot00948 \times 29$

$$= \frac{948}{100000} \times \frac{29}{1}$$

$$= \frac{27492}{100000} = \cdot27492.$$

4.

$$\begin{array}{r} 1 \\ {\cdot}01 \\ \hline {\cdot}01 \\ {\cdot}001 \\ \hline {\cdot}00001 \\ 100 \\ \hline {\cdot}00100 \end{array}$$

or $1 \times {\cdot}01 \times {\cdot}001 \times 100$

$$= 1 \times \frac{1}{100} \times \frac{1}{1000} \times 100$$

$$= \frac{100}{100000} = \frac{1}{1000} = {\cdot}001.$$

$$\begin{array}{r} {\cdot}12 \\ 1{\cdot}2 \\ \hline {\cdot}144 \\ {\cdot}012 \\ \hline {\cdot}001728 \\ 120 \\ \hline {\cdot}207360 \end{array}$$

or ${\cdot}12 \times 1{\cdot}2 \times {\cdot}012 \times 120$

$$= \frac{12}{100} \times \frac{12}{10} \times \frac{12}{1000} \times \frac{120}{1}$$

$$= \frac{207360}{1000000} = {\cdot}20736.$$

5. (1)

$$\begin{array}{r} 7{\cdot}6 \\ {\cdot}071 \\ \hline 76 \\ 532 \\ \hline {\cdot}5396 \\ 2{\cdot}1 \\ \hline 5396 \\ 10792 \\ \hline 1{\cdot}13316 \\ 29 \\ \hline 1019844 \\ 226632 \\ \hline 32{\cdot}86164 \end{array}$$

(2)

$$\begin{array}{r} {\cdot}007 \\ 700 \\ \hline 4{\cdot}900 \\ 760{\cdot}3 \\ \hline 147 \\ 294 \\ 343 \\ \hline 3725{\cdot}47 \\ {\cdot}00416 \\ \hline 2235282 \\ 372547 \\ 1490188 \\ \hline 15{\cdot}4979552 \\ 100000 \\ \hline 1549795{\cdot}52 \end{array}$$

DIVISION OF DECIMALS.

Ex. XXVIII. (p. 72.)

1. (1)

$$\begin{array}{l} 5{\cdot}16)\ 10{\cdot}836\ (2{\cdot}1 \\ \phantom{5{\cdot}16)\ }\underline{1032} \\ \phantom{5{\cdot}16)\ 1}516 \\ \phantom{5{\cdot}16)\ 1}\underline{516} \end{array}$$

$$10{\cdot}836 \div 5{\cdot}16 = \frac{10836}{1000} \times \frac{100}{516} = \frac{10836}{516} \times \frac{1}{10} = \frac{21}{10} = 2{\cdot}1.$$

·381) 34·96818 (91·78
34 29
678
381
2971
2667
3048
3048

$$34{\cdot}96818 \div {\cdot}381 = \frac{3496818}{100000} \times \frac{1000}{381} = \frac{3496818}{381} \times \frac{1}{100} = \frac{9178}{100} = 91{\cdot}78.$$

(2) 1·003) ·025075 (·025
2006
5015
5015

$$\cdot 025075 \div 1{\cdot}003 = \frac{25075}{1000000} \times \frac{1000}{1003} = \frac{25075}{1003} \times \frac{1}{1000} = \frac{25}{1000} = \cdot 025.$$

·0012) ·02916 (24·3
24
51
48
36
36

$$\cdot 02916 \div \cdot 0012 = \frac{2916}{100000} \times \frac{10000}{12} = \frac{2916}{12} \times \frac{1}{10} = \frac{243}{10} = 24{\cdot}3.$$

(3) 27) ·00081 (·00003
81

$$\cdot 00081 \div 27 = \frac{81}{100000} \times \frac{1}{27} = \frac{3}{100000} = \cdot 00003.$$

4·735) 1·770890 (·374
14205
35039
33145
18940
18940

$$1{\cdot}77089 \div 4{\cdot}735 = \frac{177089}{100000} \times \frac{1000}{4735} = \frac{1770890}{4735} \times \frac{1}{1000} = \frac{374}{1000} = \cdot 374.$$

(4) ·1) 1·0 (10
10

$$1 \div \cdot 1 = 1 \times \frac{10}{1} = 10.$$

$$\begin{array}{l} \cdot01)\ 1\cdot00\ (100 \\ \underline{100} \end{array} \qquad 1 \div \cdot01 = 1 \times \frac{100}{1} = 100.$$

$$\begin{array}{l} \cdot0001)\ 1\cdot0000\ (10000 \\ \underline{10000} \end{array} \qquad 1 \div \cdot0001 = 1 \times \frac{10000}{1} = 10000.$$

(5)

$$\begin{array}{l} \cdot126)\ 31\cdot500\ (250 \\ \underline{252} \\ \underline{630} \\ \underline{630} \end{array}$$

$$31\cdot5 \div \cdot126 = \frac{315}{10} \times \frac{1000}{126} = \frac{31500}{126} = 250.$$

$$\begin{array}{l} \cdot32)\ 5\cdot2000\ (16\cdot25 \\ \underline{32} \\ 200 \\ \underline{192} \\ 80 \\ \underline{64} \\ 160 \\ \underline{160} \end{array} \qquad \begin{aligned} 5\cdot2 \div \cdot32 &= \frac{52}{10} \times \frac{100}{32} \\ &= \frac{52000}{32} \times \frac{1}{100} = \frac{1625}{100} = 16\cdot25. \end{aligned}$$

(6)

$$\begin{array}{l} \cdot0625)\ 3217\cdot0000\ (51472 \\ \underline{3125} \\ 920 \\ \underline{625} \\ 2950 \\ \underline{2500} \\ 4500 \\ \underline{4375} \\ 1250 \\ \underline{1250} \end{array} \qquad \begin{aligned} & 3217 \div \cdot0625 \\ &= \frac{3217 \times 10000}{625} \\ &= \frac{32170000}{625} \\ &= 51472. \end{aligned}$$

$$6250)\ \cdot0321700000\ (\cdot0000051472$$

$$\begin{aligned} \cdot03217 \div 6250 &= \frac{3217}{100000} \times \frac{1}{6250} = \frac{32170000}{625} \times \frac{1}{10000000000} \\ &= \frac{51472}{10000000000} = \cdot0000051472. \end{aligned}$$

(7)

$$\begin{array}{l} 81\cdot34)\ 4\cdot63638\ (\cdot057 \\ \underline{40670} \\ 56938 \\ \underline{56938} \end{array}$$

$$4\cdot63638 \div 81\cdot34 = \frac{463638}{100000} \times \frac{100}{8134} = \frac{57}{1000} = \cdot057.$$

$$\begin{array}{r l}
\cdot019)\ 15\cdot4546\ (813\cdot4 & \\
\underline{152} & \\
25 & \\
\underline{19} & \\
64 & \\
\underline{57} & \\
76 & \\
\underline{76} &
\end{array}$$

$15\cdot4546 \div \cdot019$

$$= \frac{154546}{10000} \times \frac{1000}{19}$$

$$= \frac{8134}{10} = 813\cdot4.$$

(8) $$\begin{array}{r}
59\cdot64)\ \cdot429408\ (\cdot0072 \\
\underline{41748} \\
11928 \\
\underline{11928}
\end{array}$$

$\cdot429408 \div 59\cdot64$

$$= \frac{429408}{1000000} \times \frac{100}{5964} = \frac{72}{10000} = \cdot0072.$$

$$\begin{array}{r}
\cdot036)\ 2147\cdot040\ (59640 \\
\underline{180} \\
347 \\
\underline{324} \\
230 \\
\underline{216} \\
144 \\
\underline{144}
\end{array}$$

$2147\cdot04 \div \cdot036$

$$= \frac{214704}{100} \times \frac{1000}{36}$$

$$= \frac{2147040}{36} = 59640.$$

(9)

$$\begin{array}{r}
\cdot0012)\ 12\cdot6000\ (10500 \\
\underline{12} \\
60 \\
\underline{60}
\end{array}$$

$$12\cdot6 \div \cdot0012 = \frac{126}{10} \times \frac{10000}{12} = \frac{126000}{12} = 10500.$$

$$\begin{array}{r}
\cdot000475)\ \cdot06534100\ (137\cdot56 \\
\underline{475} \\
1784 \\
\underline{1425} \\
3591 \\
\underline{3325} \\
2660 \\
\underline{2375} \\
2850 \\
\underline{2850}
\end{array}$$

$\cdot065341 \div \cdot000475$

$$= \frac{65341}{1000000} \times \frac{1000000}{475}$$

$$= \frac{6534100}{475} \times \frac{1}{100}$$

$$= \frac{13756}{100} = 137\cdot56.$$

(10)

$\cdot0006)\ 3\cdot0120\ (5020$

$$3\cdot012 \div \cdot0006 = \frac{3012}{1000} \times \frac{10000}{6} = \frac{30120}{6} = 5020.$$

541·283) 293916·669 (543
2706415
2327516
2165132
1623849
1623849

$$293916{\cdot}669 \div 541{\cdot}283 = \frac{293916669}{1000} \times \frac{1000}{541283} = 543.$$

(11) ·0004) 130·4000 (326000

$$130{\cdot}4 \div {\cdot}0004 = \frac{1304}{10} \times \frac{10000}{4} = \frac{1304000}{4} = 326000.$$

4) 130·4 (32·6

$$130{\cdot}4 \div 4 = \frac{1304}{10} \times \frac{1}{4} = \frac{326}{10} = 32{\cdot}6.$$

4807·65) 46·634205 (·0097
4326885
3365355
3365355

$$46{\cdot}634205 \div 4807{\cdot}65 = \frac{46634205}{1000000} \times \frac{100}{480765} = \frac{97}{10000} = {\cdot}0097.$$

(12) 1·3) 1·69 (1·3
13
39
39

$$1{\cdot}69 \div 1{\cdot}3 = \frac{169}{100} \times \frac{10}{13} = \frac{13}{10} = 1{\cdot}3.$$

·13) 1·69 (13

$$1{\cdot}69 \div {\cdot}13 = \frac{169}{100} \times \frac{100}{13} = 13.$$

13) 1·69 (·13

$$1{\cdot}69 \div 13 = \frac{169}{100} \times \frac{1}{13} = \frac{13}{100} = {\cdot}13.$$

·013) 1·690 (130

$$1{\cdot}69 \div {\cdot}013 = \frac{169}{100} \times \frac{1000}{13} = \frac{1690}{13} = 130.$$

(13) 1·405) ·002810 (·002
2810

$${\cdot}00281 \div 1{\cdot}405 = \frac{281}{100000} \times \frac{1000}{1405} = \frac{2810}{1405} \times \frac{1}{1000} = \frac{2}{1000} = {\cdot}002.$$

1405) ·002810 (·000002

$${\cdot}00281 \div 1405 = \frac{281}{100000} \times \frac{1}{1405} = \frac{2810}{1405} \times \frac{1}{1000000} = \frac{2}{1000000} = {\cdot}000002.$$

·001405) ·002810 (2

$${\cdot}00281 \div {\cdot}001405 = \frac{281}{100000} \times \frac{1000000}{1405} = \frac{2810}{1405} = 2.$$

(14)

$$\begin{array}{l} 36)\,72\cdot36\,(2\cdot01 \\ \quad\;\; 72 \\ \hline \quad\;\;\;\; 36 \\ \quad\;\;\;\; 36 \\ \hline \end{array}$$

$$72\cdot36 \div 36 = \frac{7236}{100} \times \frac{1}{36} = \frac{201}{100} = 2\cdot01.$$

$$\cdot0036)\,72\cdot3600\,(20100$$

$$72\cdot36 \div \cdot0036 = \frac{7236}{100} \times \frac{10000}{36} = \frac{723600}{36} = 20100.$$

$$\begin{array}{l} 1\cdot6)\,\cdot0030000\,(\cdot001875 \\ \quad\quad 16 \\ \hline \quad\quad 140 \\ \quad\quad 128 \\ \hline \quad\quad\;\; 120 \\ \quad\quad\;\; 112 \\ \hline \quad\quad\quad 80 \\ \quad\quad\quad 80 \\ \hline \end{array}$$

$$\cdot003 \div 1\cdot6 = \frac{3}{1000} \times \frac{10}{16}$$

$$= \frac{30000}{16} \times \frac{1}{1000000}$$

$$= \frac{1875}{1000000} = \cdot001875.$$

(15)

$$\begin{array}{l} 7089)\,6725402\cdot3544\,(948\cdot7096 \\ \quad\quad 63801 \\ \hline \quad\quad\;\; 34530 \\ \quad\quad\;\; 28356 \\ \hline \quad\quad\quad 61742 \\ \quad\quad\quad 56712 \\ \hline \quad\quad\quad\; 50303 \\ \quad\quad\quad\; 49623 \\ \hline \quad\quad\quad\quad 68054 \\ \quad\quad\quad\quad 63801 \\ \hline \quad\quad\quad\quad\; 42534 \\ \quad\quad\quad\quad\; 42534 \\ \hline \end{array}$$

$$6725402\cdot3544 \div 7089$$

$$= \frac{67254023544}{10000} \times \frac{1}{7089}$$

$$= \frac{9487096}{10000} = 948\cdot7096.$$

$$\cdot7089)\,6725402\cdot3544\,(9487096$$

$$6725402\cdot3544 \div \cdot7089 = \frac{67254023544}{10000} \times \frac{10000}{7089} = 9487096.$$

(16)

$$\begin{array}{l} 396\cdot25)\,10363284\cdot750\,(26153\cdot4 \\ \quad\quad 79250 \\ \hline \quad\quad 243828 \\ \quad\quad 237750 \\ \hline \quad\quad\;\; 60784 \\ \quad\quad\;\; 39625 \\ \hline \quad\quad\;\; 211597 \\ \quad\quad\;\; 198125 \\ \hline \quad\quad\quad 134725 \\ \quad\quad\quad 118875 \\ \hline \quad\quad\quad\; 158500 \\ \quad\quad\quad\; 158500 \\ \hline \end{array}$$

$$10363284\cdot75 \div 396\cdot25$$

$$= \frac{1036328475}{100} \times \frac{100}{39625}$$

$$= \frac{10363284750}{39625} \times \frac{1}{10}$$

$$= \frac{261534}{10} = 26153\cdot4.$$

$$\begin{array}{l} \cdot0046)\ \cdot09844\ (21\cdot4 \\ \quad\quad\ \underline{92} \\ \quad\quad\ \ 64 \\ \quad\quad\ \ \underline{46} \\ \quad\quad\ \ 184 \\ \quad\quad\ \ \underline{184} \end{array}$$

$$\cdot09844 \div \cdot0046 = \frac{9844}{100000} \times \frac{10000}{46}$$

$$= \frac{214}{10} = 21\cdot4.$$

(17) $\cdot0004)\ 816\cdot0000\ (2040000$

$$816 \div \cdot0004 = \frac{816}{1} \times \frac{10000}{4} = 2040000.$$

$$\begin{array}{l} 2\cdot38645)\ \cdot0019610652875\ (\cdot00082175 \\ \quad\quad\quad\quad\ \underline{1909160} \\ \quad\quad\quad\quad\quad 519052 \\ \quad\quad\quad\quad\quad \underline{477290} \\ \quad\quad\quad\quad\quad\ 417628 \\ \quad\quad\quad\quad\quad\ \underline{238645} \\ \quad\quad\quad\quad\quad\ 1789837 \\ \quad\quad\quad\quad\quad\ \underline{1670515} \\ \quad\quad\quad\quad\quad\quad 1193225 \\ \quad\quad\quad\quad\quad\quad \underline{1193225} \end{array}$$

$$\cdot0019610652875 \div 2\cdot38645$$

$$= \frac{19610652875}{10000000000000} \times \frac{100000}{238645}$$

$$= \frac{82175}{100000000} = \cdot00082175.$$

(18)

$$\begin{array}{l} 2315)\ 18368830\cdot5\ (7934\cdot7 \\ \quad\quad\ \underline{16205} \\ \quad\quad\ \ 21638 \\ \quad\quad\ \ \underline{20835} \\ \quad\quad\quad\ 8033 \\ \quad\quad\quad\ \underline{6945} \\ \quad\quad\quad\ 10880 \\ \quad\quad\quad\ \ \underline{9260} \\ \quad\quad\quad\ \ 16205 \\ \quad\quad\quad\ \ \underline{16205} \end{array}$$

$$18368830\cdot5 \div 2315$$

$$= \frac{183688305}{10} \times \frac{1}{2315}$$

$$= \frac{79347}{10} = 7934\cdot7.$$

$231\cdot5)\ 18368830\cdot5\ (79347$

$$18368830\cdot5 \div 231\cdot5 = \frac{183688305}{10} \times \frac{10}{2315} = 79347.$$

$\cdot2315)\ 18368830\cdot5000\ (79347000$

$$18368830\cdot5 \div \cdot2315 = \frac{183688305}{10} \times \frac{10000}{2315} = \frac{183688305000}{2315} = 79347000.$$

(19)

$$\begin{array}{l} 2\cdot5)\ \cdot000050\ (\cdot00002 \\ \quad\quad\quad\quad\ \ \underline{50} \end{array}$$

$$\cdot00005 \div 2\cdot5 = \frac{5}{100000} \times \frac{10}{25} = \frac{50}{25} \times \frac{1}{100000} = \frac{2}{100000} = \cdot00002.$$

25) ·000050 (·000002

$$\cdot00005 \div 25 = \frac{5}{100000} \times \frac{1}{25} = \frac{50}{25} \times \frac{1}{1000000} = \frac{2}{1000000} = \cdot000002.$$

·0000025) ·0000500 (20

$$\cdot00005 \div \cdot0000025 = \frac{5}{100000} \times \frac{10000000}{25} = \frac{500}{25} = 20.$$

(20) 1200·21) 684·1197 (·57
600105
840147
840147

$$684\cdot1197 \div 1200\cdot21 = \frac{6841197}{10000} \times \frac{100}{120021} = \frac{57}{100} = \cdot57.$$

·0120021) 684·1197000 (57000

$$684\cdot1197 \div \cdot0120021 = \frac{6841197}{10000} \times \frac{10000000}{120021} = \frac{6841197000}{120021} = 57000.$$

2. (1) 8·7) 32·50000 (3·7356
261
640
609
310
261
490
435
550
522
28

$$32\cdot5 \div 8\cdot7 = \frac{325}{10} \times \frac{10}{87}$$
$$= \frac{3250000}{87} \times \frac{1}{10000}$$
$$= \frac{37356\ldots.}{10000} = 3\cdot7356\ldots.$$

1·7) ·02000 (·0117
17
30
17
130
119
11

$$\cdot02 \div 1\cdot7 = \frac{2}{100} \times \frac{10}{17}$$
$$= \frac{2000}{17} \times \frac{1}{10000}$$
$$= \frac{117\ldots.}{10000} = \cdot0117\ldots.$$

·013) 1·0000000 (76·9230
91
90
78
120
117
30
26
40
39
10

$$1 \div \cdot013 = \frac{1}{1} \times \frac{1000}{13}$$
$$= \frac{10000000}{13} \times \frac{1}{10000}$$
$$= \frac{769230\ \ldots}{10000} = 76\cdot9230\ldots.$$

(2) ·0063) ·00938400 (1·4895
63
308
252
564
504
600
567
330
315

$$·009384 \div ·0063$$
$$= \frac{9384}{1000000} \times \frac{10000}{.63}$$
$$= \frac{938400}{63} \times \frac{1}{10000}$$
$$= \frac{14895....}{10000} = 1·4895....$$

1·02) 51846·734000 (50830·1313
510
846
816
307
306
134
102
320
306
140
102
380
306
74

$$51846·734 \div 1·02$$
$$= \frac{51846734}{1000} \times \frac{100}{102}$$
$$= \frac{51846734000}{102} \times \frac{1}{10000}$$
$$= \frac{508301313....}{10000}$$
$$= 50830·1313....$$

(3) ·023) 7380·9640000 (320911·4782
69
48
46
209
207
26
23
34
23
110
92
180
161
190
184
60
46
14

$$7380·964 \div ·023$$
$$= \frac{7380964}{1000} \times \frac{1000}{23}$$
$$= \frac{73809640000}{23} \times \frac{1}{10000}$$
$$= \frac{3209114782....}{10000}$$
$$= 320911·4782....$$

3·42) 6·500000 (1·9005
342
3080
3078
2000
1710

$$6·5 \div 3·42 = \frac{65}{10} \times \frac{100}{342}$$

$$= \frac{6500000}{342} \times \frac{1}{10000} = 1·9005....$$

19) 25·0000 (1·3157
19
60
57
30
19
110
95
150
133

$$25 \div 19 = \frac{250000}{19} \times \frac{1}{10000}$$

$$= \frac{13157....}{10000} = 1·3157....$$

(4) ·01257) 176432·76 (14036019·0930
1257
5073
5028
4527
3771
7566
7542
2400
1257
11430
11313
11700
11313
3870
3771
990

$$176432·76 \div ·01257$$

$$= \frac{17643276}{100} \times \frac{100000}{1257}$$

$$= \frac{176432760000000}{1257} \times \frac{1}{10000}$$

$$= \frac{140360190930....}{10000}$$

$$= 14036019·0930....$$

6535496·2) 7457·13450 (·0011
65354962
92163830
65354962

$$7457·1345 \div 6535496·2 = \frac{74571345}{10000} \times \frac{10}{65354962}$$

$$= \frac{745713450}{65354962} \times \frac{1}{10000} = \frac{11....}{10000} = ·0011....$$

(5) 2·9) 37·24000 (12·8413
29
82
58
244
232
120
116
40
29
110
87

37·24 ÷ 2·9

$$= \frac{3724}{100} \times \frac{10}{29}$$

$$= \frac{3724000}{29} \times \frac{1}{10000}$$

$$= \frac{128413\ldots.}{10000}$$

$$= 12{\cdot}8413\ldots.$$

27·53) ·071900 (·0026
5506
16840
16518

$$\cdot0719 \div 27{\cdot}53 = \frac{719}{10000} \times \frac{100}{2753} = \frac{26\ldots.}{10000} = \cdot0026\ldots.$$

3. (1) 157) ·0029202 (·0000186
157
1350
1256
942
942

·0029202 ÷ 157

$$= \frac{29202}{10000000} \times \frac{1}{157}$$

$$= \frac{186}{10000000} = \cdot0000186.$$

1·57) ·0029202 (·00186

$$\cdot0029202 \div 1{\cdot}57 = \frac{29202}{10000000} \times \frac{100}{157} = \frac{186}{100000} = \cdot00186.$$

(2) 1953125) 5005·00000000 (·00256256
3906250
10987500
9765625
12218750
11718750
5000000
3906250
10937500
9765625
11718750
11718750

5005 ÷ 1953125

$$= \frac{500500000000}{1953125} \times \frac{1}{100000000}$$

$$= \frac{256256}{100000000}$$

$$= \cdot00256256.$$

$$195\cdot3125)\ 50\cdot05\ (\cdot256256$$

$$50\cdot05 \div 195\cdot3125 = \frac{5005}{100} \times \frac{10000}{1953125} = \frac{500500000000}{1953125} \times \frac{1}{1000000}$$

$$= \frac{256256}{1000000} = \cdot256256.$$

$$\cdot0001953125)\ \cdot05005\ (256\cdot256$$

$$\cdot05005 \div \cdot0001953125 = \frac{5005}{100000} \times \frac{10000000000}{1953125}$$

$$= \frac{500500000000}{1953125} \times \frac{1}{1000} = \frac{256256}{1000} = 256\cdot256.$$

(3) $7\frac{1}{2}$ of $\frac{1}{5} + \frac{17}{25} = \frac{3}{2} + \frac{17}{25} = \frac{109}{50} = \frac{218}{100} = 2\cdot18,$

$$\cdot0005)\ 2\cdot1800\ (4360\,;$$

$$\frac{428}{515} \text{ of } \frac{5}{4} \text{ of } \frac{5253}{18190} = \frac{107\times4\times5\times51\times103}{103\times5\times4\times107\times170} = \frac{51}{170} = \frac{3\times17}{17\times10} = \frac{3}{10} = \cdot3,$$

$$\therefore\ 31\cdot008 \div \cdot3 = 103\cdot36\,;$$

$$16\tfrac{2}{3} = \frac{50}{3} = \frac{100}{6},$$

and $\cdot7575 \div \frac{100}{6} = \frac{\cdot7575\times6}{100} = \frac{4\cdot5450}{100} = \cdot04545.$

Ex. XXIX. (p. 75.)

1. (1) $\begin{array}{r|l} 4 & \underline{1\cdot00} \\ & \ \cdot25 \end{array}$ $\begin{array}{r|l} 4 & \underline{3\cdot00} \\ & \ \cdot75 \end{array}$ $\begin{array}{r|l} 8 & \underline{5\cdot000} \\ & \ \cdot625 \end{array}$

$25\left\{\begin{array}{r|l} 5 & \underline{9\cdot0} \\ 5 & \underline{1\cdot80} \\ & \ \cdot36 \end{array}\right.$ $16\left\{\begin{array}{r|l} 8 & \underline{2\cdot000} \\ 2 & \underline{\ \cdot6250} \\ & \ \cdot3125 \end{array}\right.$ $20\left\{\begin{array}{r|l} 10 & \underline{19\cdot0} \\ 2 & \underline{\ 1\cdot90} \\ & \ \cdot95 \end{array}\right.$

(2) $128\left\{\begin{array}{r|l} 4 & \underline{66\cdot0} \\ 4 & \underline{16\cdot5} \\ 4 & \underline{\ 4\cdot125} \\ 2 & \underline{\ 1\cdot03125} \\ & \ \cdot515625 \end{array}\right.$ $125\left\{\begin{array}{r|l} 5 & \underline{54\cdot0} \\ 5 & \underline{10\cdot8} \\ 5 & \underline{\ 2\cdot16} \\ & \ \cdot432 \end{array}\right.$

$$200\left\{\begin{array}{r|l}100 & 570\\ 2 & 5{\cdot}7\\ & 2{\cdot}85\end{array}\right. \qquad 125\left\{\begin{array}{r|l}5 & 170\\ 5 & 34\\ 5 & 6{\cdot}8\\ & 1{\cdot}36\end{array}\right. \qquad 160\left\{\begin{array}{r|l}4 & 1{\cdot}0\\ 4 & {\cdot}25\\ 10 & {\cdot}0625\\ & {\cdot}00625\end{array}\right.$$

(3) $$64\left\{\begin{array}{r|l}4 & 11{\cdot}00\\ 4 & 2{\cdot}75\\ 4 & {\cdot}6875\\ & {\cdot}171875\end{array}\right. \qquad 240\left\{\begin{array}{r|l}10 & 57\\ 4 & 5{\cdot}7\\ 6 & 1{\cdot}425\\ & {\cdot}2375\end{array}\right.$$

∴ *Ans.* = 6·171875.

$$256\left\{\begin{array}{r|l}4 & 13\\ 4 & 3{\cdot}25\\ 4 & {\cdot}8125\\ 4 & {\cdot}203125\\ & {\cdot}05078125\end{array}\right. \qquad 512\left\{\begin{array}{r|l}4 & 3{\cdot}00\\ 4 & {\cdot}75\\ 4 & {\cdot}1875\\ 4 & {\cdot}046875\\ 2 & {\cdot}01171875\\ & {\cdot}005859375\end{array}\right.$$

$$\frac{588}{78125}=\frac{117{\cdot}6}{15625}=\frac{23{\cdot}52}{3125}=\frac{4{\cdot}704}{625}=\frac{{\cdot}9408}{125}=\frac{{\cdot}18816}{25}=\frac{{\cdot}037632}{5}={\cdot}0075264;$$

∴ *Ans.* = 15·0075264.

2. (1) $$3\tfrac{5}{8}\text{ of }\frac{1}{512}=\frac{29}{8\times512}=\frac{3{\cdot}625}{512}=\frac{{\cdot}453125}{64}=\frac{{\cdot}056640625}{8}={\cdot}007080078125.$$

(2) $$\frac{1}{2}+\frac{1}{4}+\frac{1}{16}+\frac{1}{32}=\frac{16+8+2+1}{32}=\frac{27}{32}=\frac{6{\cdot}75}{8}={\cdot}84375.$$

(3) $$\frac{1}{64}\times{\cdot}0064=\frac{1}{64}\times\frac{64}{10000}=\frac{1}{10000}={\cdot}0001.$$

(4) $$\frac{3}{5}+{\cdot}061={\cdot}6+{\cdot}061={\cdot}661.$$

(5) $$\frac{1}{2}+\frac{1}{5}-\frac{1}{8}=\frac{20+8-5}{40}=\frac{23}{40}=\frac{2{\cdot}3}{4}={\cdot}575.$$

(6) $$\frac{47\frac{5}{8}}{94}\text{ of }\frac{11\frac{3}{4}}{7{\cdot}5}=\frac{47{\cdot}625}{94}\times\frac{47}{4\times7{\cdot}5}=\frac{47{\cdot}625}{2\times30}=\frac{4{\cdot}7625}{6}={\cdot}79375.$$

(7) $$\frac{7{\cdot}75}{9}\text{ of }\frac{2\frac{1}{2}}{2\frac{7}{9}}\text{ of }\frac{20}{31}=\frac{7{\cdot}75}{9}\text{ of }\frac{\frac{5}{2}}{\frac{25}{9}}\text{ of }\frac{20}{31}$$

$$=\frac{7{\cdot}75\times5\times9\times20}{9\times2\times25\times31}=\frac{7{\cdot}75\times10}{5\times31}=\frac{7{\cdot}75\times2}{31}=\frac{15{\cdot}5}{31}={\cdot}5.$$

(8) $5\,\frac{5}{640}+{\cdot}75 \text{ of } \frac{6}{5} \text{ of } 7\frac{1}{2}=5\,\frac{{\cdot}625}{80}+{\cdot}75\times\frac{6}{5}\times\frac{15}{2}$

$=5\,\frac{{\cdot}078125}{10}+{\cdot}75\times 9=5{\cdot}0078125+6{\cdot}75=11{\cdot}7578125.$

(9) $3\,\frac{4}{25}+\frac{33}{110}+81\,\frac{37}{1000}+\frac{7\frac{3}{4}}{3\frac{7}{8}}=3\,\frac{{\cdot}8}{5}+\frac{3}{10}+81\,\frac{37}{1000}+\frac{31\times 8}{31\times 4}$

$=3{\cdot}16+{\cdot}3+81{\cdot}037+2=86{\cdot}497.$

(10) $\dfrac{247}{\frac{5}{7}}+\frac{1512}{108}+\frac{17}{7\frac{5}{9}}+200\,\frac{7}{10}+\frac{11}{62{\cdot}5}$

$=\frac{1729}{5}+\frac{168}{12}+\frac{17\times 9}{68}+200\,\frac{7}{10}+\frac{110}{625}$

$=345{\cdot}8+14+\frac{9}{4}+200{\cdot}7+\frac{4{\cdot}4}{25}$

$=345{\cdot}8+14+2{\cdot}25+200{\cdot}7+{\cdot}176=562{\cdot}926.$

Ex. XXX. (p. 80.)

1. (1) $9\,\underline{|\,5{\cdot}0\quad}$
$\quad{\cdot}\dot{5}5\ldots\ldots$

$11\,\underline{|\,2{\cdot}00\quad}$
$\quad{\cdot}\dot{1}\dot{8}18\ldots\ldots$

$37)\,1{\cdot}000\,({\cdot}\dot{0}2\dot{7}\ldots\ldots$

$$\begin{array}{r}74\\ \hline 260\\ 259\\ \hline 1\end{array}$$

$7\,\underline{|\,3{\cdot}\quad}$
$\quad{\cdot}\dot{4}2857\dot{1}4\ldots\ldots$

(2) $\frac{17}{30}=\frac{\dot{1}{\cdot}7}{3}={\cdot}5\dot{6}6\ldots\ldots;\quad \frac{368}{495}=\frac{73{\cdot}6}{99}=\frac{8{\cdot}1\dot{7}7\ldots\ldots}{11}={\cdot}7\dot{4}\dot{3}43\ldots\ldots;$

$\frac{16}{81}=\frac{1{\cdot}\dot{7}7\ldots\ldots}{9}={\cdot}\dot{1}9753086\dot{4};$

$333)\,52{\cdot}000\,({\cdot}\dot{1}5\dot{6}$

$$\begin{array}{r}333\\ \hline 1870\\ 1665\\ \hline 2050\\ 1998\\ \hline 52\end{array}$$

$\therefore\ 15\,\frac{52}{333}=15{\cdot}\dot{1}5\dot{6}.$

(3) $\frac{3231}{3520} = \frac{323\cdot1}{352} = \frac{29\cdot3\dot{7}\dot{2}72\ldots\ldots}{32} = \frac{7\cdot343\dot{1}\dot{8}18\ldots\ldots}{8} = \cdot917897\dot{7}\dot{2}.$

```
3367) 962·000000 (·2̇85714̇
      6734
      28860
      26936
       19240
       16835
        24050
        23569
          4810
          3367
         14430
         13468
           962
```

$\therefore\ 7\frac{962}{3367} = 7\cdot\dot{2}8571\dot{4}\,;$

$\frac{17}{99000} = \frac{\cdot017}{99} = \frac{\cdot001\dot{5}\dot{4}}{9} = \cdot000\dot{1}\dot{7}.$

(4)

```
9768) 83·000000000 (·0084̇97133̇
      78144
       48560
       39072
        94880
        87912
         69680
         68376
          13040
           9768
           32720
           29304
            34160
            29304
             4856
```

$\therefore\ 24\frac{83}{9768} = 24\cdot008\dot{4}9713\dot{3}\,;$

$17\frac{13}{700} = 17\frac{\cdot13}{7} = 17\cdot01\dot{8}5714\dot{2}\,;$

$2\frac{139868}{833325} = 2\frac{27973\cdot6}{166665} = 2\frac{5594\cdot72}{33333}\,;$

$$\begin{array}{l}
33333)\,5594{\cdot}7200000\,({\cdot}16\dot{7}843\dot{2}\\
\begin{array}{r}
\underline{33333}\\
226142\\
\underline{199998}\\
261440\\
\underline{233331}\\
281090\\
\underline{266664}\\
144260\\
\underline{133332}\\
109280\\
\underline{99999}\\
92810\\
\underline{66666}\\
26144
\end{array}
\end{array}$$

$$\therefore\ 2\frac{139868}{833325}=2{\cdot}16\dot{7}843\dot{2}.$$

2. (1) ${\cdot}\dot{7}=\frac{7}{9}$; ${\cdot}0\dot{7}=\frac{7-0}{90}=\frac{7}{90}$; ${\cdot}2\dot{2}\dot{7}=\frac{227-2}{990}=\frac{225}{990}=\frac{25}{110}=\frac{5}{22}$.

(2) ${\cdot}5\dot{8}\dot{3}=\frac{583-5}{990}=\frac{578}{990}=\frac{289}{495}$; ${\cdot}\dot{1}3\dot{5}=\frac{135}{999}=\frac{45}{333}=\frac{15}{111}=\frac{5}{37}$;

${\cdot}26\dot{3}=\frac{263-26}{900}=\frac{237}{900}=\frac{79}{300}$.

(3) ${\cdot}00\dot{1}8\dot{5}=\frac{185}{99900}=\frac{37}{19980}$; $3{\cdot}\dot{0}2\dot{4}=3\frac{24}{999}=3\frac{8}{333}=\frac{1007}{333}$;

${\cdot}012\dot{3}\dot{6}=\frac{1236-12}{99000}=\frac{1224}{99000}=\frac{153}{12375}=\frac{17}{1375}$.

(4) ${\cdot}\dot{1}4285\dot{7}=\frac{142857}{999999}=\frac{15873}{111111}=\frac{5291}{37037}=\frac{481}{3367}$;

${\cdot}39791\dot{6}=\frac{397916-39791}{900000}=\frac{358125}{900000}=\frac{71625}{180000}$

$=\frac{14325}{36000}=\frac{2865}{7200}=\frac{573}{1440}=\frac{191}{480}$;

${\cdot}382\dot{1}4285\dot{7}=\frac{382142857-382}{999999000}=\frac{382142475}{999999000}=\frac{42460275}{111111000}$

$=\frac{3860025}{10101000}=\frac{772005}{2020200}=\frac{154401}{404040}=\frac{51467}{134680}$.

(5) $${\cdot}\dot{3}0769\dot{2}=\frac{307692}{999999}=\frac{102564}{333333}=\frac{9324}{30303}=\frac{1036}{3367};$$

$${\cdot}6\dot{3}0769\dot{2}=\frac{6307692-6}{9999990}=\frac{6307686}{9999990}=\frac{2102562}{3333330}$$

$$=\frac{191142}{303030}=\frac{21238}{33670}=\frac{10619}{16835};$$

$$2{\cdot}7\dot{8}5714\dot{2}=2\,\frac{7857142-7}{9999990}=2\,\frac{7857135}{9999990}=2\,\frac{2619045}{3333330}=2\,\frac{238095}{303030}$$

$$=2\,\frac{79365}{101010}=2\,\frac{15873}{20202}=2\,\frac{5291}{6734}=2\,\frac{481\times 11}{481\times 14}=2\,\frac{11}{14}=\frac{39}{14}.$$

(6) $${\cdot}342\dot{7}5\dot{3}=\frac{342753-342}{999000}=\frac{342411}{999000}=\frac{114137}{333000};$$

$${\cdot}03132\dot{1}3\dot{2}=\frac{3132132-3132}{99900000}=\frac{3129000}{99900000}=\frac{1043}{33300};$$

$$8{\cdot}0208\dot{3}=8\,\frac{2083-208}{90000}=8\,\frac{1875}{90000}=8\,\frac{375}{18000}=8\,\frac{75}{3600}=8\,\frac{15}{720}$$

$$=8\,\frac{1}{48}=\frac{385}{48}.$$

(7) $$85{\cdot}6080\dot{6}=85\,\frac{60806-6080}{90000}=85\,\frac{54726}{90000}=85\,\frac{9121}{15000}$$

$$=\frac{1275000+9121}{15000}=\frac{1284121}{15000};$$

$$3{\cdot}6\dot{4}2857\dot{1}=3\,\frac{6428571-6}{9999990}=3\,\frac{6428565}{9999990}=3\,\frac{714285}{1111110}$$

$$=3\,\frac{79365\times 9}{79365\times 14}=3\,\frac{9}{14}=\frac{51}{14};$$

$$127{\cdot}000220\dot{9}\dot{5}=127\,\frac{22095-220}{99000000}=127\,\frac{21875}{99000000}$$

$$=127\,\frac{4375}{19800000}=127\,\frac{875}{3960000}=127\,\frac{175}{792000}=127\,\frac{35}{158400}$$

$$=127\,\frac{7}{31680}=\frac{4023367}{31680}.$$

Ex. XXXI. (p. 81.)

1. (1)
$$\begin{array}{r} 2\cdot418418418 \\ 1\cdot166666667 \\ 3\cdot009009009 \\ \cdot735444444 \\ 24\cdot042 \\ \hline 31\cdot371538538 \end{array}$$

∴ *Ans.* = 31·371538.

(2)
$$\begin{array}{r} 234\cdot6666666667 \\ 9\cdot9288888889 \\ \cdot0123456789 \\ \cdot0044004400 \\ 456\cdot \\ \hline 700\cdot6123016745 \end{array}$$

∴ *Ans.* = 700·612301.

(3)
$$\begin{array}{r} 6\cdot45 \\ \cdot3333333 \\ \hline 6\cdot1166667 \end{array} \qquad \begin{array}{r} 7\cdot72727272 \\ 6\cdot04545454 \\ \hline 1\cdot68181818 \end{array} \qquad \begin{array}{r} 309\cdot \\ \cdot94724724 \\ \hline 308\cdot05275276 \end{array}$$

∴ *Ans.* = 6·116666. ∴ *Ans.* = 1·681818. ∴ *Ans.* = 308·052752.

2.
$$\frac{49}{52}+\frac{278}{390}+\frac{7}{12}=\frac{49\times15+278\times2+7\times65}{780}$$

$$=\frac{735+556+475}{780}=\frac{1746}{780}=\frac{174\cdot6}{78}=\frac{29\cdot1}{13}=2\cdot\dot{2}38461\dot{5}\,;$$

$$18\,\frac{1}{12}-4\,\frac{5}{14}=18\cdot083333333-4\cdot357142857=13\cdot72\dot{6}19047\dot{6}.$$

3. (1)
$$2\cdot\dot{3}\times5\cdot\dot{6}=2\tfrac{1}{3}\times5\tfrac{2}{3}=\frac{7\times17}{9}=\frac{119}{9}=13\cdot\dot{2}\,;$$

$$\cdot75\dot{7}\dot{5}\times\cdot36\dot{6}=\frac{7575-75}{9900}\times\frac{366-36}{900}=\frac{75}{99}\times\frac{330}{900}$$

$$=\frac{75\times33}{99\times90}=\frac{5}{3\times6}=\frac{2\cdot5}{9}=\cdot2\dot{7}.$$

(2)
$$\cdot40\dot{6}\times62=\frac{406-40}{900}\times62=\frac{366\times62}{900}=\frac{122\times62}{300}$$

$$=\frac{7564}{300}=\frac{75\cdot64}{3}=25\cdot21\dot{3}\,;$$

$$825\times\cdot\dot{3}\dot{6}=825\times\frac{36}{99}=\frac{825\times4}{11}=75\times4=300.$$

(3)
$$7\cdot5\dot{2}\times48\cdot\dot{3}=7\tfrac{47}{90}\times48\tfrac{1}{3}=\frac{677\times145}{90\times3}=\frac{98165}{90\times3}$$

$$=\frac{9816\cdot5}{9\times3}=\frac{1090\cdot7\dot{2}}{3}=363\cdot5\dot{7}4\dot{0}\,;$$

$$368\times\cdot\dot{6}=368\times\frac{2}{3}=\frac{736}{3}=245\cdot\dot{3}.$$

(4) $3{\cdot}1\dot{4}\dot{5}\times{\cdot}4\dot{2}9\dot{7}=3\frac{144}{990}\times\frac{4293}{9990}=\frac{3114\times4293}{990\times9990}=\frac{13368402}{9890100}=1{\cdot}35169\ldots.$

$20\tfrac{4}{7}\times{\cdot}\dot{8}\dot{4}=\frac{144}{7}\times\frac{84}{99}=\frac{16\times12}{11}=\frac{192}{11}=17{\cdot}\dot{4}\dot{5}.$

4. (1) $195{\cdot}0\dot{2}\div4=48{\cdot}7\dot{5}$;

$${\cdot}37\dot{5}9\dot{2}\div{\cdot}0\dot{5}=\frac{37592-37}{99900}\times\frac{90}{5}=\frac{37555\times90}{99900\times5}$$

$$=\frac{7511}{1110}=\frac{203\times37}{30\times37}=\frac{20{\cdot}3}{3}=6{\cdot}7\dot{6}.$$

(2) $54\div{\cdot}1\dot{7}=54\div\frac{16}{90}=\frac{54\times90}{16}=\frac{27\times90}{8}=\frac{2430}{8}=303{\cdot}75$;

$13{\cdot}\dot{2}\div5{\cdot}\dot{6}=13\tfrac{2}{9}\div5\tfrac{6}{9}=\frac{119}{9}\times\frac{3}{17}=\frac{7}{3}=2{\cdot}\dot{3}.$

(3) $411{\cdot}3\dot{5}1\dot{9}\div58{\cdot}7\dot{6}4\dot{5}=411\,\frac{3516}{9990}\div58\,\frac{7638}{9990}$

$$=\frac{4109406}{9990}\times\frac{9990}{587058}=\frac{4109406}{587058}=7;$$

$2{\cdot}1659\dot{5}\div{\cdot}0\dot{4}=2\,\frac{14936}{90000}\times\frac{90}{4}=\frac{194936}{4\times1000}=\frac{48734}{1000}=48{\cdot}734$;

$${\cdot}6559\dot{9}0\dot{3}\div48{\cdot}76=\frac{6553344}{9990000}\times\frac{100}{4876}$$

$$=\frac{1344\times4876}{99900\times4876}=\frac{13{\cdot}44}{999}={\cdot}0134\ldots.$$

QUESTIONS AND EXAMPLES IN DECIMALS.

Ex. XXXII. (p. 81.)

I.

(1) ${\cdot}0625=\frac{625}{10000}=\frac{25}{400}=\frac{1}{16}$; $3{\cdot}14159=\frac{314159}{100000}$;

$$\begin{array}{r}20\tfrac{5}{14}=20{\cdot}3\dot{5}71428\dot{5}71\\ 17\tfrac{1}{12}=\underline{17{\cdot}08\dot{3}3333333}\\ 3{\cdot}27\dot{3}8095\dot{2}38\end{array}$$

(2) $$10\tfrac{3}{8}+1\tfrac{5}{40}+\frac{7}{10}+\frac{13}{16}=11+\frac{3}{8}+\frac{1}{8}+\frac{7}{10}+\frac{13}{16}$$

$$=11+\frac{30+10+56+65}{80}=11+\frac{161}{80}=13\tfrac{1}{80}=13{\cdot}0125.$$

Again,

$$10\tfrac{3}{8}+1\tfrac{5}{40}+\frac{7}{10}+\frac{13}{16}=10{\cdot}375+1{\cdot}125+{\cdot}7+{\cdot}8125=13{\cdot}1025.$$

(3) $$\begin{array}{r}573{\cdot}005\\ {\cdot}000754\\ \hline 573{\cdot}005754\end{array}\qquad\qquad \begin{array}{r}573{\cdot}005\\ {\cdot}000754\\ \hline 573{\cdot}004246\end{array}\qquad\qquad \begin{array}{r}573{\cdot}005\\ {\cdot}000754\\ \hline 2292020\\ 2865025\\ 4011035\\ \hline {\cdot}432045770\end{array}$$

```
·000754) 573·0050000 (759953·5....
         5278
          4520
          3770
           7505
           6786
            7190
            6786
             4040
             3770
              2700
              2262
               4380
               3770
                610
```

Proofs of the above :

$$573{\cdot}005+{\cdot}000754=\frac{573005}{1000}+\frac{754}{1000000}=\frac{573005000+754}{1000000}$$

$$=\frac{573005754}{1000000}=573{\cdot}005754;$$

$$573{\cdot}005-{\cdot}000754=\frac{573005000-754}{1000000}=\frac{573004246}{1000000}=573{\cdot}004246;$$

$$573{\cdot}005\times{\cdot}000754=\frac{573005}{1000}\times\frac{754}{1000000}=\frac{432045770}{1000000000}={\cdot}43204577;$$

$$573{\cdot}005\div{\cdot}000754=\frac{573005}{1000}\times\frac{1000000}{754}$$

$$=\frac{5730050000}{754}\times\frac{1}{10}=759953{\cdot}5\ldots.$$

Again,

$$\begin{array}{r} 1{\cdot}015 \\ {\cdot}01015 \\ \hline 1{\cdot}02515 \end{array} \qquad \begin{array}{r} 1{\cdot}015 \\ {\cdot}01015 \\ \hline 1{\cdot}00485 \end{array} \qquad \begin{array}{r} 1{\cdot}015 \\ {\cdot}01015 \\ \hline 5075 \\ 1015 \\ 1015 \\ \hline {\cdot}01030225 \end{array}$$

$$\begin{array}{l} {\cdot}01015)\,1{\cdot}01500\,(100 \\ \qquad\quad\;\; \underline{1015} \\ \qquad\qquad\;\; 00 \end{array}$$

Proofs of the above:

$$1{\cdot}015+{\cdot}01015=\frac{1015}{1000}+\frac{1015}{100000}=\frac{101500+1015}{100000}=\frac{102515}{100000}=1{\cdot}02515;$$

$$1{\cdot}015-{\cdot}01015=\frac{101500-1015}{100000}=\frac{100485}{100000}=1{\cdot}00485;$$

$$1{\cdot}015\times{\cdot}01015=\frac{1015}{1000}\times\frac{1015}{100000}=\frac{1030225}{100000000}={\cdot}01030225;$$

$$1{\cdot}015\div{\cdot}01015=\frac{1015}{1000}\times\frac{100000}{1015}=\frac{100000}{1000}=100.$$

(4) $$\frac{3}{6144}=\frac{1}{2048}=\frac{1}{8\times256}=\frac{1}{8\times8\times32}=\frac{1}{2^3\times2^3\times2^5},$$

and therefore, since each factor of the denominator is a power of 2, the fraction is convertible into a terminating decimal.

(5) 1. $2\frac{1}{3}+72\frac{5}{8}+316\frac{1}{6}+2{\cdot}875=390+\frac{1}{3}+\frac{5}{8}+\frac{1}{6}+2{\cdot}875=390+\frac{27}{24}+2{\cdot}875$

$=391+\frac{1}{8}+2{\cdot}875=391+{\cdot}125+2{\cdot}875=394.$

2. ${\cdot}026649\div2\frac{15}{16}={\cdot}026649\times\frac{16}{47}={\cdot}00567\times16={\cdot}009072.$

3. $$\frac{1-{\cdot}05}{5+{\cdot}5}\times\frac{3-{\cdot}8}{3{\cdot}8}\div\frac{1}{10}=\frac{{\cdot}95}{5{\cdot}5}\times\frac{2{\cdot}2}{3{\cdot}8}\times\frac{10}{1}$$

$$=\frac{19\times{\cdot}05}{11\times{\cdot}5}\times\frac{11\times{\cdot}2}{19\times{\cdot}2}\times\frac{10}{1}=\frac{{\cdot}05\times10}{{\cdot}5}=\frac{{\cdot}5}{{\cdot}5}=1.$$

4. $$\{{\cdot}18+{\cdot}009\}\div{\cdot}016={\cdot}189\div{\cdot}016=\frac{189}{1000}\times\frac{1000}{16}=\frac{189}{16}$$

$$=\frac{47{\cdot}25}{4}=11{\cdot}8125.$$

(6) $$\frac{48\frac{4}{7}}{1085\frac{7}{10}} \div \frac{7\frac{3}{11}}{174\frac{3}{17}} = \frac{\frac{340}{7}}{\frac{10857}{10}} \div \frac{\frac{80}{11}}{\frac{2961}{17}} = \frac{340 \times 10}{7 \times 10857} \div \frac{80 \times 17}{11 \times 2961}$$

$$= \frac{340 \times 10 \times 11 \times 2961}{7 \times 10857 \times 80 \times 17} = \frac{17 \times 4 \times 5 \times 10 \times 11 \times 141 \times 3 \times 7}{7 \times 141 \times 77 \times 2 \times 4 \times 10 \times 17}$$

$$= \frac{5 \times 3}{7 \times 2} = \frac{15}{7 \times 2} = \frac{7{\cdot}5}{7} = 1{\cdot}0\dot{7}1428\dot{5};$$

$$91{\cdot}\dot{8}5\dot{3} \div 87{\cdot}5\dot{6} = 91\,\frac{853}{999} \div 87\,\frac{51}{90} = \frac{91762}{999} \times \frac{90}{7881} = \frac{917620}{111 \times 7881}$$

$$= \frac{97620}{874791} = 1{\cdot}048\ldots\ldots = 1{\cdot}05 \text{ nearly.}$$

II.

(1) $\cdot 000000700409$; $\frac{121345}{10000} = \frac{24269}{2000}$; $\cdot 0032546$.

(2) Three hundred and ninety-seven thousand and eight, and four hundred and five thousand and nine millionths; 397008405·009; 397·008405009. Three hundred and ninety-seven millions, eight thousand four hundred and five, and nine thousandths. Three hundred and ninety-seven, and eight millions four hundred and five thousand and nine thousand millionths.

(3) $$\frac{5}{8} = \cdot 625$$

$$\frac{7}{16} = \cdot 4375$$

$$\frac{3}{4} = \cdot 75$$

$$\begin{array}{r}\cdot 09375\\ 2{\cdot}46\end{array}$$

$$125\left\{\begin{array}{r|r} 5 & 4{\cdot}36625\\ \hline 5 & \cdot 87325\\ \hline 5 & \cdot 17465\\ \hline & \cdot 03493 \end{array}\right.$$

decimal required ·03493

(4) $$\begin{array}{r} 1{\cdot}05\\ 10{\cdot}5\\ \hline 525\\ 105\\ \hline 11{\cdot}025 \end{array}$$

$$= \frac{11025}{1000} = \frac{2205}{200} = \frac{441}{40},$$

$$1620\left\{\begin{array}{r|l} 9 & \cdot 8727588\\ \hline 9 & \cdot 0969732\\ \hline 2 & \cdot 0107748\\ \hline 10 & \cdot 0053874\\ \hline & \cdot 00053874 \end{array}\right.$$

$$\frac{\cdot 0003 \times \cdot 004}{\cdot 006} = \frac{\cdot 0000012}{\cdot 006} = \cdot 0002;$$

$$\frac{1}{16} + \frac{9}{400} - \frac{13}{625} = \frac{625 + 225 - 208}{10000} = \frac{642}{10000} = \cdot 0642.$$

(5) 1.

$$\begin{array}{l} 23)\,21{\cdot}0\,({\cdot}91304\ldots\ldots \\ \quad\;\; 207 \\ \quad\;\;\; \overline{\;\;30} \\ \quad\;\;\;\;\; 23 \\ \quad\;\;\;\;\; \overline{\;\;70} \\ \quad\;\;\;\;\;\;\; 69 \\ \quad\;\;\;\;\;\;\; \overline{\;100} \\ \quad\;\;\;\;\;\;\;\;\;\; 92 \end{array}$$

$$\therefore\ \frac{1}{10000}\text{ of }\frac{21}{23} = {\cdot}000091304\ldots\ldots$$

2. $$\left(2\tfrac{1}{2}+6\right)\div\left(3\tfrac{1}{2}-\frac{1}{8}\right)=\frac{17}{2}\div\frac{27}{8}=\frac{17\times 8}{2\times 27}=\frac{68}{27}=\frac{22{\cdot}\dot{6}}{9}=2{\cdot}\dot{5}1\dot{8}.$$

3. $$\frac{4{\cdot}4+\frac{3}{5}}{7{\cdot}375+\frac{3}{4}-\frac{1}{8}}=\frac{4{\cdot}4+{\cdot}6}{7{\cdot}375+{\cdot}75-{\cdot}125}=\frac{5}{8{\cdot}125-{\cdot}125}=\frac{5}{8}={\cdot}625.$$

4. $$2\,\frac{1}{3000}=2\,\frac{{\cdot}001}{3}=2{\cdot}000\dot{3}33$$

$$1\,\frac{5}{1600}=1\,\frac{{\cdot}05}{16}=1{\cdot}003125$$

$$5\,\frac{1}{6000}=5\,\frac{{\cdot}001}{6}=5{\cdot}0001\dot{6}7$$

$$\begin{array}{r} 2{\cdot}000875 \\ \hline 10{\cdot}0045 \end{array}$$

(6)

$$\begin{array}{r} 3132{\cdot}458)\,7823{\cdot}6572\,(2{\cdot}4976096088 \\ 6264916 \\ \hline 15587412 \\ 12529832 \\ \hline 30575800 \\ 28192122 \\ \hline 23836780 \\ 21927206 \\ \hline 19095740 \\ 18794748 \\ \hline 30099200 \\ 28192122 \\ \hline 19070780 \\ 18794748 \\ \hline 27603200 \\ 25059664 \\ \hline 25435360 \\ 25059664 \\ \hline 375696 \end{array}$$

III.

(1)

$$\begin{array}{r l}
1200\cdot21)\ 684\cdot1197\ (\cdot57 & \\
\underline{600105} & \\
840147 & \\
\underline{840147} &
\end{array}$$

$\cdot0120021)\ 684\cdot1197000\ (57000$

$$\begin{array}{l}
\cdot047)\ 594\cdot270000\ (12644\cdot042\ldots\ldots \\
\quad\ \underline{47} \\
\quad\ 124 \\
\quad\ \ \underline{94} \\
\quad\ \ 302 \\
\quad\ \ \underline{282} \\
\quad\ \ \ 207 \\
\quad\ \ \ \underline{188} \\
\quad\ \ \ \ 190 \\
\quad\ \ \ \ \underline{188} \\
\quad\ \ \ \ \ 200 \\
\quad\ \ \ \ \ \underline{188} \\
\quad\ \ \ \ \ \ 120 \\
\quad\ \ \ \ \ \ \ \underline{94} \\
\quad\ \ \ \ \ \ \ 26
\end{array}$$

(2) 1. $$\frac{\cdot015\times2\cdot1}{\cdot035}=\frac{\frac{15}{1000}\times\frac{21}{10}}{\frac{35}{1000}}=\frac{15\times21\times1000}{1000\times10\times35}=\frac{3\times3}{10}=\frac{9}{10}=\cdot9.$$

2. $$\frac{3\frac{1}{2}-\cdot04}{5-\cdot0625}=\frac{\frac{7}{2}-\frac{4}{100}}{5-\frac{625}{10000}}=\frac{\frac{350-4}{100}}{\frac{50000-625}{10000}}=\frac{34600}{49375}$$

$$=\frac{6920}{9875}=\frac{1384}{1975}=\cdot7007\ldots\ldots$$

3. $$\frac{3}{5}+\cdot14+\frac{3}{4}\text{ of }1\cdot0784=\frac{3}{5}+\frac{14}{100}+\frac{3}{4}\text{ of }\frac{10784}{10000}$$

$$=\frac{74}{100}+\frac{3\times2696}{10000}=\frac{7400+8088}{10000}=\frac{15488}{10000}=1\cdot5488,$$

and $$\frac{15488}{10000}=\frac{1936}{1250}=\frac{968}{625}.$$

4. $$\left(\frac{1}{4}-\frac{1}{9}\right)\times\left(\frac{3}{5}+1\frac{1}{2}\right)=\frac{5}{36}\times\frac{21}{10}=\frac{7}{24}=\frac{3\cdot5}{12}=\cdot291\dot{6}.$$

(3) $5{\cdot}\dot{8}\dot{1} \times {\cdot}458\dot{3} = 5\tfrac{81}{99} \times \dfrac{4583-458}{9000} = \dfrac{576 \times 4125}{99 \times 9000} = \dfrac{576 \times 375}{9 \times 9000}$

$= \dfrac{64 \times 375}{9000} = \dfrac{24000}{9000} = \dfrac{8}{3} = 2{\cdot}\dot{6}$;

$1{\cdot}1\dot{3} \div {\cdot}00\dot{0}13\dot{2} = 1\tfrac{12}{90} \div \dfrac{132}{999900} = \dfrac{102}{90} \times \dfrac{999900}{132} = \dfrac{102 \times 9090}{9 \times 12}$

$= \dfrac{102 \times 1010}{12} = 17 \times 505 = 8585,$

$\dfrac{91}{560} = \dfrac{13}{80}$, and since $80 = 2 \times 2 \times 2 \times 10$, the fraction will be reducible to a terminating decimal.

(4) $1\tfrac{1}{12} + 2\tfrac{2}{15} + 3\tfrac{3}{20} + 4\tfrac{4}{27} = 10 + \dfrac{22}{60} + \dfrac{4}{27} = 10 + \dfrac{11}{30} + \dfrac{4}{27} = 10\tfrac{139}{270}.$

Again,
$$\begin{array}{l} 1\tfrac{1}{12} = 1{\cdot}083\dot{3}33 \\ 2\tfrac{2}{15} = 2{\cdot}133\dot{3}33 \\ 3\tfrac{3}{20} = 3{\cdot}15 \\ \underline{4\tfrac{4}{27} = 4{\cdot}\dot{1}4\dot{8}148} \\ \qquad 10{\cdot}5\dot{1}4\dot{8}14 = 10\dfrac{5143}{9990} = 10\dfrac{37 \times 139}{37 \times 270} = 10\dfrac{139}{270}. \end{array}$$

(5) He walks $(60 - 13{\cdot}95)$ miles $= 46{\cdot}05$ miles in three days,

$$3\,\underline{|\,46{\cdot}05}$$

he walks $15{\cdot}35$ miles each day.

(6) He sells ${\cdot}1\dot{7}$ of ${\cdot}1875$ or $\dfrac{16}{90}$ of ${\cdot}1875$;

therefore, he has left $\left(1 - \dfrac{16}{90}\right)$ of ${\cdot}1875$

$= \dfrac{74}{90}$ of ${\cdot}1875 = \dfrac{74 \times 1875}{90 \times 10000} = \dfrac{74 \times 125}{6 \times 10000} = \dfrac{74}{6 \times 80} = \dfrac{37}{240}.$

IV.

(1)
$$\begin{array}{r} 1{\cdot}23 \\ {\cdot}123 \\ {\cdot}0123 \\ {\cdot}00123 \\ 123{\cdot} \\ \hline 124{\cdot}36653 \end{array}$$

$= \dfrac{12436653}{100000}$

$31{\cdot}\dot{4}5\dot{7} = 31\dfrac{457}{999}$,

and $\dfrac{494}{15} - 31\dfrac{457}{999} = 32\dfrac{14}{15} - 31\dfrac{457}{999}$

$= 1\dfrac{4662 - 2285}{4995} = 1\dfrac{2377}{4995}.$

(2) 3006005; three hundred thousand, six hundred and five-tenths.

(3) $5\times{\cdot}05={\cdot}25$; $1{\cdot}5\times{\cdot}75=1{\cdot}125$; $2{\cdot}625\div5={\cdot}525$;

therefore, in order of magnitude they stand thus:

$$1{\cdot}5\times{\cdot}75;\quad 2{\cdot}625\div5;\quad 5\times{\cdot}05.$$

(4) $${\cdot}0\dot{1}4\dot{7}\times{\cdot}33\dot{3}=\frac{147}{9990}\times\frac{1}{3}=\frac{49}{9990}={\cdot}0\dot{0}4\dot{9};$$

$${\cdot}1269\dot{3}\div19{\cdot}\dot{3}\dot{9}=\frac{11424}{90000}\div19\tfrac{39}{99}=\frac{3808}{30000}\div19\tfrac{13}{33}=\frac{3808\times33}{30000\times640}$$

$$=\frac{476\times11}{10000\times80}=\frac{5236}{800000}={\cdot}006545;$$

```
·245) 132790·000 (542000
      1225
      ────
       1029
        980
       ────
         490
         490
        ────
          000
```

$${\cdot}014904\div3\tfrac{6}{25}=\frac{{\cdot}014904\times25}{81}=\frac{{\cdot}001656\times25}{9}={\cdot}000184\times25={\cdot}0046;$$

```
3·05) 61061·00 (20020              305000) 6106·10000 (·02002
      610                                  610000
      ──────                               ──────────
         610                                   610000
         610                                   610000
         ────                                  ──────
           0
```

(5)

```
·90438                                    ·90437532
·90437532                                 ·90437
─────────                                 ─────────
·00000468                                 ·00000532
```

and since of these differences ·00000468 is the less, it follows that the statement in the question is correct.

To find an approximate value of the expression

$$16\times\left\{\frac{1}{5}-\frac{1}{3\times5^3}+\frac{1}{5\times5^5}-\frac{1}{7\times5^7}+\&c.\right\}-\frac{4}{239},$$

we have $\frac{1}{5}={\cdot}2$; $\frac{1}{3\times5^3}=\frac{{\cdot}2}{3\times25}=\frac{{\cdot}008}{3}={\cdot}002667$;

$\frac{1}{5\times5^5}=\frac{{\cdot}008}{5\times25}=\frac{{\cdot}00032}{5}={\cdot}000064$; $\frac{1}{7\times5^7}=\frac{{\cdot}000064}{7\times5}={\cdot}000002$ nearly;

the last result shews us that we may neglect the rest of the series, and we get

$$16\times\{{\cdot}2-{\cdot}002667+{\cdot}000064-{\cdot}000002\}-\frac{4}{239}$$

$$=(16\times{\cdot}197395)-{\cdot}01673=3{\cdot}15832-{\cdot}01673=3{\cdot}14159.$$

(6) After the first sale he has remaining

$${\cdot}85 \text{ or } \frac{17}{20} \text{ of the estate;}$$

therefore, after the second sale he has

$$\left(1-\frac{5}{17}\right)\text{of}\,\frac{17}{20}=\frac{12}{17}\,\text{of}\,\frac{17}{20}=\frac{12}{20}=\frac{3}{5}.$$

V.

(1) $$\frac{1}{2}(6\tfrac{1}{2}+2\tfrac{2}{3}-3)=\frac{1}{2}\{5\tfrac{7}{6}\}=\frac{1}{2}\times\frac{37}{6}=\frac{37}{12}=3{\cdot}08\dot{3};$$

$$\frac{8978}{3125}=\frac{1795{\cdot}6}{625}=\frac{359{\cdot}12}{125}=\frac{71{\cdot}824}{25}=\frac{14{\cdot}3648}{5}=2{\cdot}87296;$$

$$3\tfrac{5}{8}\times\left(3\tfrac{1}{4}-\frac{2}{3}\right)\text{of}\,\frac{6}{7}=\frac{29}{8}\times\frac{39-8}{12}\times\frac{6}{7}$$

$$=\frac{29\times31\times6}{8\times12\times7}=\frac{899}{8\times2\times7}=\frac{112{\cdot}375}{2\times7}=\frac{56{\cdot}1875}{7}=8{\cdot}0267\dot{8}5714\dot{2}.$$

(2) 1. $$\frac{4{\cdot}255\times{\cdot}032}{{\cdot}00016}=\frac{4{\cdot}255\times{\cdot}016\times2}{{\cdot}016\times{\cdot}01}=\frac{4{\cdot}255\times2}{{\cdot}01}=\frac{8{\cdot}51}{{\cdot}01}=851.$$

2. $$\left(\frac{1}{2}+\frac{1}{4}+\frac{1}{6}+\frac{1}{8}+\frac{1}{10}\right)\div\left(\frac{1}{3}+\frac{1}{5}+\frac{1}{9}+\frac{1}{15}\right)$$

$$=\frac{60+30+20+15+12}{120}\div\frac{30+18+10+6}{90}=\frac{137}{120}\times\frac{90}{64}$$

$$=\frac{137\times3}{4\times64}=\frac{411}{4\times64}=\frac{102{\cdot}75}{64}=\frac{12{\cdot}84375}{8}=1{\cdot}60546875.$$

3. $$\left(\frac{9}{11}\text{ of }35\tfrac{1}{5}-3\tfrac{1}{8}\right)+(2{\cdot}5625+7\tfrac{1}{4})$$

$$=\left(\frac{9}{11}\text{ of }35{\cdot}2-3{\cdot}125\right)+(2{\cdot}5625+7{\cdot}25)=9\times3{\cdot}2-3{\cdot}125+9{\cdot}8125$$

$$=28{\cdot}8-3{\cdot}125+9{\cdot}8125=25{\cdot}675+9{\cdot}8125=35{\cdot}4875.$$

4. $\cdot 59\dot{3} \div 1\cdot 78 \times \cdot\dot{3}\dot{6} \div \cdot 072 = \frac{534}{900} \times \frac{100}{178} \times \frac{36}{99} \times \frac{1000}{72} = \frac{3 \times 1000}{9 \times 99 \times 2}$

$$= \frac{500}{3 \times 99} = \frac{45\cdot\dot{4}\dot{5}}{3 \times 9} = \frac{5\cdot\dot{0}\dot{5}}{3} = 1\cdot\dot{6}8350\dot{1}.$$

(4)

$$\begin{aligned}
1 &= 1\cdot 00000000 \\
\frac{1}{1} &= 1\cdot 00000000 \\
\frac{1}{1 \times 2} &= \cdot 50000000 \\
\frac{1}{1 \times 2 \times 3} &= \cdot 16666667 \\
\frac{1}{1 \times 2 \times 3 \times 4} &= \cdot 04166667 \\
\frac{1}{1 \times 2 \times 3 \times 4 \times 5} &= \cdot 00833333 \\
\frac{1}{1 \times 2 \times 3 \times 4 \times 5 \times 6} &= \cdot 00138889 \\
\frac{1}{1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7} &= \cdot 00019841 \\
\frac{1}{1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8} &= \cdot 00002480 \\
\frac{1}{1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9} &= \cdot 00000275 \\
\frac{1}{1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10} &= \cdot 00000027 \\
\frac{1}{1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10 \times 11} &= \cdot 00000002 \\
\therefore \text{ sum} &= 2\cdot 71828181
\end{aligned}$$

$$\frac{1}{10^3} \times \left(1 - \frac{3}{10^3} + \frac{3 \times 4}{1 \times 2} \times \frac{1}{10^4} + \frac{3 \times 4 \times 5}{1 \times 2 \times 3} \times \frac{1}{10^6}\right)$$

$$= \frac{1}{10^3} \times \left(1 - \frac{3}{100} + \frac{6}{10000} + \frac{10}{1000000}\right)$$

$$= \frac{1}{10^3} \times \left(\frac{100000 - 3000 + 60 + 1}{100000}\right)$$

$$= \frac{97061}{1000 \times 100000} = \frac{97061}{100000000} = \cdot 00097061.$$

(5)

$$\begin{array}{l}
111\cdot454)\ 883845\cdot0000\ (7925\cdot7\text{ miles nearly}\\
\underline{780178}\\
1031670\\
\underline{1003086}\\
285840\\
\underline{222908}\\
629320\\
\underline{557270}\\
720500
\end{array}$$

(6)

$$\begin{array}{r}
\cdot12\dot{5}55556\\
4\cdot16363636\\
\underline{9\cdot45777778}\\
13\cdot74696970
\end{array}$$

VI.

(1)

$$\begin{array}{r}
404\cdot04\\
\underline{\cdot030303}\\
121212\\
121212\\
121212\\
\hline
12\cdot24362412
\end{array}$$

$$\begin{aligned}
\cdot\dot{3}4\dot{5}\times\frac{\cdot111}{4\cdot3}&=\frac{345}{999}\times\frac{111}{1000}\times\frac{10}{43}\\
&=\frac{345}{9\times100\times43}=\frac{115}{3\times100\times43}\\
&=\frac{1\cdot15}{129}=\cdot0089147\ldots.
\end{aligned}$$

$$\begin{array}{l}
\cdot6593)\ \cdot04813489963\ (\cdot0730091\\
\underline{46151}\\
19838\\
\underline{19779}\\
59996\\
\underline{59337}\\
6593\\
\underline{6593}
\end{array}$$

$$\cdot006593)\ \cdot04813489963\ (7\cdot30091$$

(2)

$$\begin{array}{r}
20\cdot5\\
\underline{2\cdot05}\\
22\cdot55
\end{array}
\qquad
\begin{array}{r}
20\cdot5\\
\underline{2\cdot05}\\
18\cdot45
\end{array}
\qquad
\therefore\frac{22\cdot55}{18\cdot45}=\frac{2255}{1845}=\frac{451}{369}.$$

(3)

$$\frac{123\cdot48}{1033\cdot2}=\frac{12348}{103320}=\frac{1029}{8610}=\frac{343}{2870}=\frac{49}{410};$$

$$\frac{36\cdot595}{5\cdot7980}=\frac{36595}{5798}=\frac{13\times2815}{13\times446}=\frac{2815}{446}=6\tfrac{139}{446}.$$

(4)

$$\frac{\cdot375\times\cdot375-\cdot025\times\cdot025}{\cdot375-\cdot025}=\frac{\cdot140625-\cdot000625}{\cdot375-\cdot025}=\frac{\cdot14}{\cdot35}=\frac{14}{35}=\frac{2}{5};$$

$$3+\cfrac{1}{7+\cfrac{1}{16}}=3+\cfrac{1}{\cfrac{113}{16}}=3\tfrac{16}{113},$$

and

$$\begin{array}{l} 113)\,16\cdot00\,(\cdot14159\ldots \\ \underline{113} \\ \ \ 470 \\ \ \ \underline{452} \\ \ \ \ \ 180 \\ \ \ \ \ \underline{113} \\ \ \ \ \ \ \ 670 \\ \ \ \ \ \ \ \underline{565} \\ \ \ \ \ \ \ \ 1050 \\ \ \ \ \ \ \ \ \underline{1017} \\ \ \ \ \ \ \ \ \ \ \ 33 \end{array}$$

$\therefore\ 3\frac{16}{113} = 3\cdot14159$ nearly;

$$\cdot12931\dot{3}\dot{1} = \frac{12931-129}{99000} = \frac{12802}{99000} = \frac{6401}{49500}.$$

(5) $1\frac{7}{24} + \frac{5}{8} + \frac{13}{36} = 1 + \frac{21+45+26}{72} = 1\frac{92}{72} = 2\frac{20}{72}$;

therefore, to make this equal to 3, we must add

$$\frac{52}{72} = \frac{13}{18} = \frac{6\cdot5}{9} = \cdot7\dot{2}.$$

(6) Dividend $= 2\frac{11}{12} \times \cdot15 = \frac{35\times\cdot15}{12} = \frac{35\times\cdot05}{4} = \frac{17\cdot5}{4} = \cdot4375$.

REDUCTION.

Ex. XXXIII. (p. 102.)

(1) 1.

£.
57
20
1140*s.*
12
13680*d.*

Guineas.
613
21
613
1226
12873*s.*
12
154476*d.*
4
617904*q.*

2.

£. *s.*
15 . 12
20
312*s.*
12
3744*d.*

Guineas.
5000
21
105000
12
1260000*d.*

3. s. d.
8 . $4\frac{1}{2}$
12
100*d.*
2
201 halfpence.

£. s. d.
1 . 0 . $3\frac{3}{4}$
20
20*s.*
12
243*d.*
4
975*q.*

4. £. s. d.
83 . 15 . $6\frac{1}{4}$
20
1675*s.*
12
20106*d.*
4
80425*q.*

£. s. d.
393 . 0 . $11\frac{1}{2}$
20
7860*s.*
12
94331*d.*
2
188663 halfpence.

5. Half-crowns.
738
30
22140*d.*
4
88560*q.*

Crowns.
570
5
2850*s.*
3
8550 fourpenny-pieces.

6. Half-guineas.
2673
21
2673
5346
56133 sixpences
6
336798*d.*
4
1347192*q.*

Guineas.
$22\frac{1}{2}$
2
45 half-guineas
21
45
90
945 sixpences.

(2) *q.*
4 | 5673542 – 2*q.*
12 | 1418385 – 9*d.*
2,0 | 11819,8 – 18*s.*
5909

Ans. £5909 18*s.* $9\frac{1}{2}$*d.*

£. s. d.
5909 . 18 . $9\frac{1}{2}$
20
118198
12
1418385
4
5673542*q.*

(3) £.
25
8
200 half-crowns
5
1000 sixpences
6
4 | 6000 *d.*
1500 fourpences.

(4) Fourpences.
6300
4
3,0 | 2520,0 *d.*
840 half-crowns
5
21 | 4200 sixpences
200 half-guineas.

(5)
$$\overset{\text{seven-shilling-pieces.}}{351} = \frac{351\times7\times2}{21} = 117\times2 = \overset{\text{half-guineas.}}{234.}$$

Again,
$$\overset{\text{seven-shilling-pieces.}}{351} = \frac{351\times7}{27} = 13\times7 = \overset{\text{moidores.}}{91.}$$

(6) 1.

$$\begin{array}{r}
\text{lbs. oz. dwts. grs.}\\
59\ .\ 7\ .\ 14\ .\ 19\\
\underline{12}\\
715\\
\underline{20}\\
14314\\
\underline{24}\\
57256\\
28628\\
\underline{19}\\
343555\text{ grs.}
\end{array}
\qquad
\begin{array}{rl}
 & \text{grs.}\\
24\begin{cases}4\\6\end{cases} & \left.\begin{array}{|l}37400157-1\\ \hline 9350039-5\end{array}\right\}21\\
2,0 & \begin{array}{|l}\hline 155833,9-19\text{ dwts.}\end{array}\\
12 & \begin{array}{|l}\hline 77916\\ \hline 6493\end{array}
\end{array}$$

$$\textit{Ans.}\ \overset{\text{lbs.}}{6493}\ .\ \overset{\text{dwts.}}{19}\ .\ \overset{\text{grs.}}{21}$$

2.

$$\begin{array}{rl}
 & \text{scruples.}\\
 & 56332005\\
 & \qquad\qquad 20\\
24\begin{cases}4\\6\end{cases} & \left.\begin{array}{|l}\hline 1126640100-0\\ \hline 281660025-3\end{array}\right\}12\text{ grs.}\\
2,0 & \begin{array}{|l}\hline 4694333,7-17\text{ dwts.}\end{array}\\
12 & \begin{array}{|l}\hline 2347166\ \ -2\text{ oz.}\\ \hline 195597\end{array}
\end{array}
\qquad
\begin{array}{r}
\text{lbs.}\\
536\\
\underline{12}\\
6432\text{ oz.}\\
\underline{8}\\
51456\text{ drams.}\\
\underline{3}\\
154368\text{ scruples.}
\end{array}$$

$$\textit{Ans.}\ \overset{\text{lbs. Troy.}}{195597}\ .\ \overset{\text{oz.}}{2}\ .\ \overset{\text{dwts.}}{17}\ .\ \overset{\text{grs.}}{12}$$

3.

$$\begin{array}{r}
\text{tons. cwt. qrs. lbs.}\\
7\ .\ 15\ .\ 2\ .\ 16\\
\underline{20}\\
155\text{ cwt}\\
\underline{4}\\
622\text{ qrs.}\\
\underline{28}\\
4992\\
\underline{1244}\\
17432\text{ lbs.}\\
\underline{16}\\
104592\\
\underline{17432}\\
278912\text{ oz.}
\end{array}
\qquad
\begin{array}{rl}
 & \text{drs.}\\
16\begin{cases}4\\4\end{cases} & \left.\begin{array}{|l}7563241-1\\ \hline 1890810-2\end{array}\right\}9\text{ drs.}\\
16\begin{cases}4\\4\end{cases} & \left.\begin{array}{|l}\hline 472702-2\\ \hline 118175-3\end{array}\right\}14\text{ oz.}\\
28\begin{cases}4\\7\end{cases} & \left.\begin{array}{|l}\hline 29543-3\\ \hline 7385-0\end{array}\right\}3\text{ lbs.}\\
4 & \begin{array}{|l}\hline 1055-3\text{ qrs.}\end{array}\\
2,0 & \begin{array}{|l}\hline 26,3-3\text{ cwt.}\\ \hline 13\end{array}
\end{array}$$

$$\textit{Ans.}\ \overset{\text{tons.}}{13}\ .\ \overset{\text{cwt.}}{3}\ .\ \overset{\text{qrs.}}{3}\ .\ \overset{\text{lbs.}}{3}\ .\ \overset{\text{oz.}}{14}\ .\ \overset{\text{drs.}}{9}$$

4.

$$\begin{array}{r|l} & \quad\text{oz.} \\ 16\begin{cases}4\\4\end{cases} & \left.\begin{array}{l}5838297-1\\ \hline 1459574-2\end{array}\right\}9\text{ oz.} \\ \hline 28\begin{cases}4\\7\end{cases} & \left.\begin{array}{l}364893-1\\ \hline 91223-6\end{array}\right\}25\text{ lbs.} \\ \hline 4 & 13031-3\text{ qrs.} \\ \hline 2{,}0 & 325{,}7-17\text{ cwt.} \\ \hline & 162 \end{array}$$

tons. cwt. qrs. lbs. oz.
Ans. 162 . 17 . 3 . 25 . 9

$$\begin{array}{r l} \text{tons. cwt. qrs. lbs. drs.} & \\ 33\ .\ 17\ .\ 3\ .\ 27\ .\ 15 & \\ 20 & \\ \hline 677 & \text{cwt.} \\ 4 & \\ \hline 2711 & \text{qrs.} \\ 28 & \\ \hline 21715 & \\ 5422 & \\ \hline 75935 & \text{lbs.} \\ 16 & \\ \hline 455610 & \\ 75935 & \\ \hline 1214960 & \text{oz.} \\ 16 & \\ \hline 7289775 & \\ 1214960 & \\ \hline 19439375 & \text{drs.} \end{array}$$

5.

$$\begin{array}{r l} \text{lbs. oz. sc.} & \\ 17\ .\ 2\ .\ 2 & \\ 12 & \\ \hline 206 & \text{oz.} \\ 8 & \\ \hline 1648 & \text{drs.} \\ 3 & \\ \hline 4946 & \text{sc.} \\ 20 & \\ \hline 98920 & \text{grs.} \end{array}$$

grs. Apoth. grs. Troy.
34678 = 34678

the grain being the same in each measure.

$$\begin{array}{r|l} 24\begin{cases}4\\6\end{cases} & \left.\begin{array}{l}34678-2\\ \hline 8669-5\end{array}\right\}22\text{ grs.} \\ \hline 2{,}0 & 144{,}4-4\text{ dwts.} \\ \hline & 72 \end{array}$$

oz. dwts. grs.
Ans. 72 . 4 . 22

6.

$$\begin{array}{r l} \text{cwt. qrs. lbs.} & \\ 375\ .\ 2\ .\ 15 & \\ 4 & \\ \hline 1502 & \text{qrs.} \\ 28 & \\ \hline 12031 & \\ 3004 & \end{array}$$

$$\begin{array}{r|l} 14\begin{cases}2\\7\end{cases} & \left.\begin{array}{l}42071-1\\ \hline 21035-0\end{array}\right\}1\text{ lb.} \\ \hline & 3005 \end{array}$$

stones. lb.
Ans. 3005 . 1

$$\begin{array}{r|l} & \text{st.} \\ 2 & 573421-1\text{ stone} \\ \hline 4 & 286710-2\text{ qrs.} \\ \hline 2{,}0 & 7167{,}7-17\text{ cwt.} \\ \hline & 3583 \end{array}$$

tons. cwt. qrs. stone.
Ans. 3583 . 17 . 2 . 1

7.
mi. fur. po.
3 . 7 . 8
8
31 fur.
40
1248 poles
5½
6240
624
6864 yds.

miles.
573
1760
34380
4011
573
1008480 yds.
3
3025440 ft.
12
36305280 inches

8.
inches.
12 | 1364428 – 4 in.
3 | 113702 – 2 ft.
| 37900
| 2
11 | 75800 – 10 half-yards
4,0 | 689,0 – 10 po.
8 | 172 – 4 fur.
3 | 21
7

lea. fur. po. yds. ft. in.
Ans. 7 . 4 . 10 . 5 . 2 . 4

mi. fur. yds.
74 . 3 . 4
8
595 fur.
40
23800 poles.
5½
119004
11900
130904 yds.
3
392712 ft.
12
4712544 in.

9.
lea. mi. in.
4 . 2 . 2
3
14 mi.
1760
840
98
14
24640 yds.
3
73920 ft.
12
887042 in.
3
2661126 barley corns.

mi. po.
50 . 3
8
400 fur.
40
16003 po.
5½
80015
8001½
88016½ yards.

10.
fur. yds.
7 . 200
220
$22\left\{\begin{array}{r|l}2&1740-0\\11&870-1\end{array}\right\}$ 2 yds.
79

chains yds.
Ans. 79 . 2

cub. span cub. in.
6 . 1 = 6 . 9
18
12 | 117 – 9 in.
9

ft. in.
Ans. 9 . 9

11.

yds. qr.
84 . 1
4
337 qrs.
4
1348 na.

Eng. ells. qr.
56 . 1
5
281 qrs.
4
1124 na.

12.

Fr. ells. qr.
83 . 3
6
501 qrs.
4
2004 na.

Fl. ells. qr.
73 . 1
3
220 qrs.
4
880 na.

13.

ac. ro.
35 . 2
4
142 ro.
40
5680 po.

ac. ro.
56 . 2
4
226 ro.
40
9040 po.
30¼
271200
2260
273460 sq. yds.

14.

ro. po. yds.
3 . 37 . 26
40
157 po.
30¼
4736
39¼
4775¼ sq. yds.
9
42977¼ sq. ft.
144
171908
171908
42977
36
6188724 sq. inches.

ac. po.
3 . 30
4
12 r.
40
510 po.
30¼
15300
127½
15427½ sq. yds.
9
138847½ sq. ft.

15.

ac. ro.
15 . 3
4
63 ro.
25000
315000
126
1575000 sq. links.

$$\begin{array}{r|l}
 & \text{po.} \\
4,0 & 5000,0 \\
4 & 1250 \quad - 2 \\
 & 312
\end{array}$$

Ans. 312 ac. 2 ro.

16.
c. yds.
29
27
203
58
783 c. ft

1728) 158279 (91 c. ft.
15552
2759
1728
1031

c. ft.
27 {3 | 91 – 1
27 {9 | 30 – 3} 10 c. ft.
3

Ans. 3 c. yds. 10 c. ft. 1031 c. in.

17.
c. yds. c. in.
17 . 1001
27
119
34
459 c. ft.
1728
3672
918
3213
459
1001
794153 c. in.

c. yds. c. ft.
26 . 19
27
201
52
721 c. ft.
1728
5768
1442
5047
721
1245888 c. in.

18.
galls.
563
4
2252 qts.
2
4504 pts.

gills
4 | 365843 – 3 gills
2 | 91460
4 | 45730 – 2 qts.
11432

Ans. 11432 galls. 2 qts. 3 gills.

19.
pipes. hhd. galls.
5 . 1 . 35
2
11
63
33
66
35
728 galls.
8
5824 pts.

gills
4 | 487634 – 2 gills
8 | 121908 – 4 pts.
42 {6 | 15238 – 4
42 {7 | 2539 – 5} 34 galls.
362

Ans. 362 tierces, 34 galls. 4 pts. 2 gills.

20.
hhds. bar.
6 . 1
1½
10 bar.
36
360 galls.
8
2880 pts.

pts.
8 | 2307621 – 5 pts.
63 {7 | 288452 – 3
63 {9 | 41207 – 5} 38 galls.
4578

Ans. 4578 hhds. 38 galls. 5 pts.

21.
bush. pks.
760 . 3
4
3043 pks.
2
6086 galls.
4
24344 qts.

qrs. coomb. pks.
2 . 1 . 3
2
5 coombs
4
20 bush.
4
83 pks.
2
166 galls.

22.
pints.
8 | 3659712
2 | 457464
4 | 228732
8 | 57183 – 7 bush.
5 | 7147 – 2 qrs.
1429

Ans. 1429 loads, 2 qrs. 7 bush.

lds. qr. bush.
7 . 1 . 2
5
36 qrs.
8
290 bush.
4
1160 pks.

23.
chald.
250
36
1500
750
9000 bush.

pks.
4 | 186043 – 3 pks.
36 { 3 | 46510 – 1 }
36 { 12 | 15503 – 11 } 34 bush.
1291

Ans. 1291 chald. 34 bush. 3 pks.

24.
reams quires
56 . 19
20
1139 quires
24
4556
2278
27336 sheets.

sheets.
24 { 4 | 52073 – 1 }
24 { 6 | 13018 – 4 } 17 sheets
2,0 | 216͞9 quires
108

Ans. 108 reams 9 quires 17 sheets.

25.
wks. dys. hrs.
36 . 5 . 17
7
257 d.
24
1045
514
6185 hrs.
60
371100 min.
60
22266000 sec.

mo. hrs. sec.
1 . 23 . 59
30
30 days
24
143
60
743 hrs.
60
44580 min.
60
2674859 sec.

(7)

half-pints
2 | 1336381
2 | $668190\frac{1}{2}$ pints
4 | $334095\frac{1}{4}$ quarts
36 {4 | $83523\frac{13}{16}$ gallons
36 {9 | $20880\frac{61}{64}$
$2320\frac{61}{576}$ barrels.

(8)

days hrs.
365 . 6 = $365\frac{1}{4}$ days.

yrs. dys.
27 . 245
$365\frac{1}{4}$
135
162
81
$6\frac{3}{4}$
245
$10106\frac{3}{4}$
24
40424
20212
18
242562 hrs.
60
14553720 min.
60
873223200 sec.

(9)

	dys.	hrs.
In August there remain	26	3
In September there are	30	
In October	31	
In November	30	
In December	31	
In January	31	
In February	28	
To March 3rd., 6 A.M..	2	6
	209	9

dys. hrs.
209 . 9
24
845
418
5025 hrs.
60
301500 min.
60
18090000 sec.

(10)

sq. miles
50535 in England,
8125 in Wales,
29167 in Scotland,
87827 sq. miles in all,
640
3513080
526962
56209280 sq. acres.

Ex. XXXIV. (p. 105).

(1) £23. 9*s*. 8*d*. (2) £253. 10*s*. 8*d*. (3) £252. 3*s*. $3\frac{3}{4}$*d*.

(4) £153. 16*s*. $3\frac{3}{4}$*d*. (5) £271. 10*s*. (6) £3329. 8*s*. $1\frac{1}{2}$*d*.

(7) 143 tons, 15 cwt., 3 qrs., 18 lbs. (8) 14 lbs., 9 oz., 2 drs., 19 grs.

(9) 223 ac., 3 ro., 15 po.

(10) £241. 18*s*. $7\frac{1}{4}$*d*.; £2778. 6*s*. 11*d*.; £1967. 12*s*. $7\frac{1}{4}$*d*.; £3722. 11*s*. $5\frac{3}{4}$*d*.; £66851. 0*s*. $4\frac{1}{2}$*d*.; £79251. 16*s*. $0\frac{1}{2}$*d*.; £769861. 15*s*. $2\frac{1}{2}$*d*.

(11) 49lbs., 10oz., 13grs.; 193lbs., 9oz., 19dwts.; 1757lbs., 1oz., 18dwts., 14grs.

(12) 3oz., 2drs., 9grs.; 232lbs., 4oz., 4drs., 1sc.; 246lbs., 4oz., 2drs., 17grs.

(13) 98 lbs., 10 oz., 13 drs.; 2 tons, 13 cwt., 3 qrs., 24 lbs., 8 oz.; 2214 tons, 9 cwt., 2 qrs., 26 lbs.; 153 tons, 9 cwt., 2 qrs., 2 lbs., 2 oz.

(14) 176yds., 2ft., 5in.; 199m., 2fur.; 166m., 7fur., 13 po., 1yd., 2ft., 1in.; 125 lea., 2 m., 4 fur., 198 yds.

(15) 185 yds., 1 qr., 3 na.; 182 Eng. ells.

(16) 181 ac., 16 po.; 87 ac., 2 ro., 26 po., 14½ sq. yds., 2 sq. ft., 93 sq. in.

(17) 85 c. yds., 9 c. ft., 575 c. in.; 74 po., ¼ sq. yd., 8 sq. ft., 53 sq. in.

(18) 304 gals., 1 qt.; 47 pipes, 55 gals., 1 qt.; 403 hhds., 36 gals., 7 pts.

(19) 260 qrs., 3 pks., 11 pts.; 1702 lds., 6 bus., 1 pk.

(20) 28 mo., 1 wk., 19 hrs., 40 m.; 216 yrs., 39 wks., 6 d., 17 hrs., 51 m., 51 sec.

(21) To find *A*'s age, we must add together the given ages of *B*, *C*, *D*, *E* and add to the result 4 years, since that will be the age of *F* on his 5th birthday:

∴ the result will be 35 yrs., 7 mo., 2 wks., 3 d., 13 hrs.

Ex. XXXV. (p. 107).

(1)

£.	s.	d.
2	0	$7\frac{2}{3}$
12	16	$0\frac{3}{4}$
4	14	$8\frac{5}{6}$
10	0	$0\frac{1}{2}$
1	7	$5\frac{3}{8}$
14	15	$7\frac{7}{12}$
45	14	$6\frac{17}{24}$

$$\frac{2}{3}+\frac{3}{4}+\frac{5}{6}+\frac{1}{2}+\frac{3}{8}+\frac{7}{12}$$
$$=\frac{16+18+20+12+9+14}{24}$$
$$=\frac{89}{24}=3\tfrac{17}{24}.$$

(2)

£.	s.	d.
20	16	$5\frac{1}{9}$
14	15	$0\frac{2}{7}$
5	13	$8\frac{13}{21}$
33	19	$1\frac{1}{3}$
18	3	$4\frac{5}{7}$
93	7	$8\frac{4}{63}$

$$\frac{1}{9}+\frac{2}{7}+\frac{13}{21}+\frac{1}{3}+\frac{5}{7}$$
$$=\frac{7+18+39+21+45}{63}$$
$$=\frac{130}{63}=2\tfrac{4}{63}.$$

(3)

£.	s.	d.
1	3	$6\frac{2}{3}$
2	4	$7\frac{9}{10}$
3	5	$8\frac{5}{6}$
4	9	$1\frac{13}{15}$
6	16	$6\frac{19}{25}$
17	19	$8\frac{2}{75}$

$$\frac{2}{3}+\frac{9}{10}+\frac{5}{6}+\frac{13}{15}+\frac{19}{25}$$
$$=\frac{100+135+125+130+114}{150}$$
$$=\frac{604}{150}=4\tfrac{4}{150}=4\tfrac{2}{75}.$$

(4)

£.	s.	d.
23	6	$0\frac{7}{8}$
4	0	$9\frac{1}{2}$
57	17	$8\frac{15}{16}$
96	19	$11\frac{5}{12}$
157	7	$7\frac{11}{24}$
339	12	$2\frac{3}{16}$

$$\frac{7}{8}+\frac{1}{2}+\frac{15}{16}+\frac{5}{12}+\frac{11}{24}$$
$$=\frac{42+24+45+20+22}{48}$$
$$=\frac{153}{48}=3\tfrac{9}{48}=3\tfrac{3}{16}.$$

(5)

£.	s.	d.
273	16	$7\frac{19}{20}$
370	11	$3\frac{4}{5}$
621	13	$9\frac{1}{4}$
197	4	$11\frac{3}{8}$
		$5\frac{9}{10}$
1463	7	$2\frac{11}{40}$

$$\frac{19}{20}+\frac{4}{5}+\frac{1}{4}+\frac{3}{8}+\frac{9}{10}$$
$$=\frac{38+32+10+15+36}{40}$$
$$=\frac{131}{40}=3\tfrac{11}{40}.$$

Ex. XXXVI. (p. 109.)

1. £20. 8*s.* 10*d.* **2.** £62. 11*s.* 4*d.* **3.** £189. 14*s.* 0½*d.*

4. £888. 0*s.* 2½*d.* **5.** £331. 19*s.* 11½*d.* **6.** £313. 6*s.* 1¾*d.*

7. 4 cwt., 3 qrs., 5 lbs., 7 oz. **8.** 12 fur., 36 po., 1 yd.

9. 5 ac., 2 ro., 31 po. **10.** 55 qrs., 5 bus., 1 pk., 1 gal.

11. £77. 17*s.* 10¾*d.*

12. (1) 38 lbs., 4 oz., 9 dwts., 10 grs. (2) 859 lbs., 4 oz., 6 dwts., 5 grs.

(3) 6 tons, 16 cwt., 3 qrs., 5 lbs. (4) 17 tons, 13 cwt., 3 qrs., 19 lbs.

(5) 15 lbs., 8 oz., 4 drs., 1 sc. (6) 30 yds., 1 qr., 2 na.

(7) 1 yd., 1 ft., 10 in. (8) 11 yds., 1 ft., 1 in.

(9) 1 m., 5 fur., 36 po., 5 yds. (10) 6 lea., 2 m., 6 fur. 23 po., 4 yds., 2 ft.

(11) 7 ac., 2 ro., 36 po. (12) 1 ro., 28 po., 28 sq. yds., 8 sq. ft.

(13) 1 cub. yd., 20 cub. ft., 1305 cub. in. (14) 15 tuns, 2 hhds., 53 gals., 1 qt., 1 pt.

(15) 5 bar., 3 fir., 3 qts. (16) 4 lds., 4 qrs., 7 bus., 3 pks.

(17) 2 mo., 1 wk., 3 d. (18) 9°, 36′, 55″.

(19) £52. 0*s.* 4¼*d.*

(20)

£.	s.	d.	
4759	10	9¼	value of furnished house,
1494	11	9¾	.... unfurnished house,
3264	18	11½	value of furniture,
1494	11	9¾	value of house,
1770	7	1¾	value of furniture above value of house.

Ex. XXXVII. (p. 111.)

(1)

£.	s.	d.
3	13	$9\frac{3}{4}$
2	15	$5\frac{1}{6}$
	18	$4\frac{7}{12}$

$$\frac{3}{4}-\frac{1}{6}=\frac{9-2}{12}=\frac{7}{12}.$$

(2)

£.	s.	d.
20	0	0
15	15	$0\frac{6}{7}$
4	4	$11\frac{1}{7}$

(3)

£.	s.	d.
23	13	$7\frac{1}{5}$
19	19	$7\frac{3}{5}$
3	13	$11\frac{3}{5}$

(4)

£.	s.	d.
416	10	$5\frac{1}{2}$
305	11	$9\frac{5}{8}$
110	18	$7\frac{7}{8}$

$$1\tfrac{1}{2}-\frac{5}{8}=\frac{3}{2}-\frac{5}{8}$$
$$=\frac{12-5}{8}=\frac{7}{8}.$$

(5)

£.	s.	d.
2163	1	$7\frac{5}{12}$
364	2	$5\frac{13}{16}$
1798	19	$1\frac{29}{48}$

$$1\tfrac{5}{12}-\frac{13}{16}=\frac{17}{12}-\frac{13}{16}$$
$$=\frac{68-39}{48}=\frac{29}{48}.$$

Ex. XXXVIII. (p. 112.)

(1)

£.	s.	d.
11	13	6
		2
23	7	0

£.	s.	d.
11	13	6
		5
58	7	6

(2)

£.	s.	d.
2	18	$7\frac{1}{2}$
		4
11	14	6

£.	s.	d.
2	18	$7\frac{1}{2}$
		6
17	11	9

(3)

£.	s.	d.
1	16	$6\frac{1}{4}$
		7
12	15	$7\frac{3}{4}$

£.	s.	d.
1	16	$6\frac{1}{4}$
		9
16	8	$8\frac{1}{4}$

(4)

£.	s.	d.
2	15	$2\frac{3}{4}$
		5
13	6	$1\frac{3}{4}$

£.	s.	d.
2	15	$2\frac{3}{4}$
		8
22	1	10

(5)

£.	s.	d.
3	16	$0\frac{3}{4}$
		11
41	16	$8\frac{1}{4}$

£.	s.	d.
3	16	$0\frac{3}{4}$
		12
45	12	9

(6)

£.	s.	d.
7	19	$7\frac{1}{2}$
		10
79	16	3

£.	s.	d.
7	19	$7\frac{1}{2}$
		12
95	15	6

(7)

£.	s.	d.
347	15	9¾
		3
1043	7	5¼

£.	s.	d.
347	15	9¾
		11
3825	13	11¼

(8)

£.	s.	d.	
583	0	10	
		12	
6996	10	0	for 12
583	0	10	for 1
7579	10	10	for 13

£.	s.	d.	
583	0	10	
		2	
1166	1	8	for 2
		8	
9328	13	4	for 16

(9)

£.	s.	d.	
1875	13	8¾	
		3	
5627	1	2¼	for 3
		7	
39389	8	3¾	for 21

£.	s.	d.	
1875	13	8¾	
		8	
15005	9	10	for 8
		8	
120043	18	8	for 64

(10)

£.	s.	d.	
721	0	5¼	
		9	
6489	3	11¼	for 9
		9	
58402	15	5¼	for 81

£.	s.	d.	
721	0	5¼	
		8	
5768	3	6	for 8
		12	
69218	2	0	for 96

(11)

£.	s.	d.	
5072	12	8½	
		10	
50726	7	1	for 10
		11	
557989	17	11	for 110
10145	5	5	for 2
568135	3	4	for 112

£.	s.	d.	
5072	12	8½	
		10	
50726	7	1	for 10
		12	
608716	5	0	for 120
40581	1	8	for 8
649297	6	8	for 128

(12)

£.	s.	d.	
1100	11	9¼	
		6	
6603	10	7½	for 6
		10	
66035	6	3	for 60
2201	3	6½	for 2
68236	9	9½	for 62

£.	s.	d.	
1100	11	9¼	
		10	
11005	17	8½	for 10
		8	
88047	1	8	for 80
2201	3	6½	for 2
90248	5	2½	for 82

£.	s.	d.	
1100	11	9¼	
		10	
11005	17	8½	for 10
		9	
99052	19	4½	for 90
3301	15	3¾	for 3
102354	14	8¼	for 93

(13)

£.	s.	d.	
2579	0	0¾	
		12	
30948	0	9	for 12
		12	
371376	9	0	for 144
7737	0	2¼	for 3
379113	9	2¼	for 147

£.	s.	d.	
2579	0	0¾	
		12	
30948	0	9	for 12
		12	
371376	9	0	for 144
28369	0	8¼	for 11
399745	9	8¼	for 155

£.	s.	d	
2579	0	0¾	
		10	
25790	0	7½	for 10
		10	
257900	6	3	for 100
		4	
1031601	5	0	for 400
180530	4	4½	for 70
10316	0	3	for 4
1222447	9	7½	for 474

£.	s.	d.	
2579	0	0¾	
		10	
25790	0	7½	for 10
		10	
257900	6	3	for 100
		10	
2579003	2	6	for 1000
		2	
5158006	5	0	for 2000
773700	18	9	for 300
77370	1	10½	for 30
2579	0	0¾	for 1
6011656	5	8¼	for 2331

(14)

lbs.	oz.	dwts.	grs.
86	7	16	11
			8
693	2	11	16

lbs.	oz.	dwts.	grs.	
86	7	10	11	
			4	
346	7	5	20	for 4
			9	
3119	5	12	12	for 36

(15)

tons	cwt.	qrs.	lbs.	oz.
3	0	0	27	13
				11
33	2	2	25	15

tons	cwt.	qrs.	lbs.	oz.	
3	0	0	27	13	
				7	
21	1	2	26	11	for 7
				10	
210	17	1	14	14	for 70
18	1	1	26	14	for 6
228	18	3	13	12	for 76

(16)

lbs.	oz.	drs.	sc.
45	7	3	2
			12
547	5	4	0

lbs.	oz.	drs.	sc.	
45	7	3	2	
			11	
501	10	0	1	for 11
			6	
3011	0	2	0	for 66
91	2	7	1	for 2
3102	3	1	1	for 68

(17)

yds.	qr.	na.
67	1	2
		9
606	1	2

yds.	qr.	na.	
67	1	2	
		5	
336	3	2	for 5
		10	
3368	3	0	for 50
202	0	2	for 3
3570	3	2	for 53

(18)

fur.	po.	yds.	ft.	in.
		70	2	10
				7
2	10	1	1	10

mi.	fur.	po.	yds.	ft.	in.	
			70	2	10	
					4	
	1	11	2¼	2	4	for 4
					7	
1	1	1	0⅓	1	4	for 28
		12	4	2	10	for 1
1	1	14	0	1	2	for 29

(19)

ac.	r.	po.	yds.	ft.
	67	38	27	2
				11
186	3	27	26¾	4

ac.	r.	po.	yds.	f.	
	67	38	27	2	
				4	
67	3	35	17¼	8	for 4
				4	
271	3	22	11½	5	for 16
				7	
1903	0	36	23	8	for 112

(20)

ac.	r.	po.
380	3	32
		12
4571	1	24

ac.	r.	po.	
380	3	32	
		10	
3809	2	0	for 10
		10	
38095	0	0	for 100
2285	2	32	for 6
40380	2	32	for 106

(21)

gals.	qts.
57	3
	10
577	2

gals.	qts.	
57	3	
	10	
577	2	for 10
	10	
5775	0	for 100
	2	
11550	0	for 200
2887	2	for 50
404	1	for 7
14841	3	for 257

(22)

lds.	qrs.	bus.	pks.	
	76	5	2	
			12	
184	0	2	0	for 12
15	1	5	2	for 1
199	1	7	2	for 13

lds.	qrs.	bus.	pks.	
	76	5	2	
			6	
92	0	1	0	for 6
			4	
368	0	4	0	for 24
			10	
3681	0	0	0	for 240

(23)

yr.	w.	d.	h.	m.
	5	6	18	14
				11
1	13	4	8	34

yrs.	w.	d.	h.	m.	
	5	6	18	14	
				10	
1	7	4	14	20	for 10
				10	
11	24	3	23	20	for 100
				3	
34	21	4	22	0	for 300
3	22	6	19	0	for 30
1	1	4	20	6	for 9
38	46	2	13	6	for 339

(24)

hhds.	gals.	pt.	
84	43	1	
		3	
254	21	3	for 3
		9	
2289	35	3	for 27

hhds.	gals.	pt.	
84	43	1	
		10	
846	53	2	for 10
		10	
8468	28	4	for 100
		3	
25405	22	4	for 300
5081	4	4	for 60
338	46	4	for 4
30825	10	4	for 364

(25)

bar.	gal.	qt.	pt.	
43	14	1	1	
			4	
173	17	2	0	for 4
			9	
1561	13	2	0	for 36
130	4	0	1	for 3
1691	17	2	1	for 39

bar.	gal.	qt.	pt.	
43	13	1	1	
			10	
433	25	3	0	for 10
			10	
4337	5	2	0	for 100
			7	
30360	2	2	0	for 700
2602	10	2	0	for 60
173	17	2	0	for 4
33135	30	2	0	for 764

(26)

£.	s.	d.	
1	0	$9\frac{1}{2}$	
		10	
10	7	11	for 10
		6	
62	7	6	for 60
7	5	$6\frac{1}{2}$	for 7
69	13	$0\frac{1}{2}$	cost of lambs.

£.	s.	d.	
2	2	$11\frac{1}{4}$	
		10	
21	9	$4\frac{1}{2}$	for 10
		7	
150	5	$7\frac{1}{2}$	for 70
6	8	$9\frac{3}{4}$	for 3
156	14	$5\frac{1}{4}$	cost of sheep.

£.	s.	d.	
37	0	$2\frac{3}{4}$	
		4	
148	0	11	cost of cows.

£.	s.	
38	17	
	5	
194	5	for 5
	3	
582	15	for 15
77	14	for 2
660	9	cost of horses.

£.	s.	d.	
69	13	$0\frac{1}{2}$	cost of lambs.
156	14	$5\frac{1}{4}$	.... sheep.
148	0	11	.... cows.
660	9	0	.... horses.
18	7	6	expenses.
1053	4	$10\frac{3}{4}$	whole outlay.

(27)

7	chests
18	
126	drawers
8	
1008	divisions.

£.	s.	d.	
16	6	8	
		10	
163	6	8	for 10
		10	
1633	6	8	for 100
		10	
16333	6	8	for 1000
130	13	4	for 8
16464	0	0	for 1008.

Ex. XXXIX. (p. 114.)

(1)

£.	s.	d.
6	12	$8\frac{5}{6}$
		3
19	18	$2\frac{1}{2}$

£.	s.	d.
6	12	$8\frac{5}{6}$
		11
73	0	$1\frac{1}{6}$

£.	s.	d.	
6	12	$8\frac{5}{6}$	
		6	
39	16	5	for 6
		9	
358	7	9	for 54
19	18	$2\frac{1}{2}$	for 3
378	5	$11\frac{1}{2}$	for 57.

(2)

£.	s.	d.	
75	13	$9\frac{1}{5}$	
		4	
302	15	$0\frac{4}{5}$	

£.	s.	d.	
75	13	$9\frac{1}{5}$	
		5	
378	8	10	for 5
		3	
1135	6	6	for 15.

£.	s.	d.	
75	13	$9\frac{1}{5}$	
		11	
832	11	$5\frac{1}{5}$	for 11
		8	
6660	11	$5\frac{3}{5}$	for 88.

(5)

£.	s.	d.	
125	19	$11\frac{11}{16}$	
		8	
1007	19	$9\frac{1}{2}$	for 8
		6	
6047	18	9	for 48.

£.	s.	d.	
125	19	$11\frac{11}{16}$	
		12	
1511	19	$8\frac{1}{4}$	for 12
		12	
18143	16	3	for 144.

£.	s.	d.	
125	19	$11\frac{11}{16}$	
		10	
1259	19	$8\frac{7}{8}$	for 10
		10	
12599	17	$4\frac{3}{4}$	for 100
		5	
62999	6	$11\frac{3}{4}$	for 500
8819	18	$2\frac{1}{8}$	for 70
881	19	$9\frac{13}{16}$	for 7
72701	4	$11\frac{11}{16}$	for 577.

(3)

£.	s.	d.	
709	17	$11\frac{11}{12}$	
		6	
4259	7	$11\frac{1}{2}$	

£.	s.	d.	
709	17	$11\frac{11}{12}$	
		12	
8518	15	11	for 12
		2	
17037	11	10	for 24
1419	15	$11\frac{5}{6}$	for 2
18457	7	$9\frac{5}{6}$	for 26.

£.	s.	d.	
709	17	$11\frac{11}{12}$	
		12	
8518	15	11	for 12
		10	
85187	19	2	for 120

(4)

£.	s.	d.	
525	14	$0\frac{5}{8}$	
		6	
3154	4	$3\frac{3}{4}$	for 6
		7	
22079	10	$2\frac{1}{4}$	for 42.

£.	s.	d.	
525	14	$0\frac{5}{8}$	
		4	
2102	16	$2\frac{1}{2}$	for 4
		11	
23130	18	$3\frac{1}{2}$	for 44.

£.	s.	d.	
525	14	$0\frac{5}{8}$	
		10	
5257	0	$6\frac{1}{4}$	for 10
		10	
52570	5	$2\frac{1}{2}$	for 100
31542	3	$1\frac{1}{2}$	for 60
1577	2	$1\frac{7}{8}$	for 3
85689	10	$5\frac{7}{8}$	for 163.

Ex. XL. (p. 116).

(1)
£. s. d.
2 | 7 16 2
3 18 1

(2)
£. s. d.
3 | 6 8 9
2 2 11

(3)
£. s. d.
2 | 75 8 6½
37 14 3¼

(4)
£. s. d.
3 | 19 14 9¾
6 11 7¼

(5)
£. s. d.
4 | 245 14 8
61 8 8

(6)
£. s. d.
5 | 86 16 5½
17 7 3½

(7)
£. s. d.
6 | 82 13 7½
13 15 7¼

(8)
£. s. d.
7 | 435 17 2¼
62 5 3¾

(9)
£. s. d.
8 | 409 6 2
51 3 3¼

(10)
£. s. d.
9 | 605 0 1½
67 4 5½

(11)
£. s. d.
11 | 386 16 5¼
35 3 3¾

(12)
£. s. d.
12 | 473 14 6
39 9 6½

(13)
£. s. d.
23) 33 . 18 . 6 (1£
23
10
20
23) 218 (9s.
207
11
12
23) 138 (6d.
138

Ans. £1. 9s. 6d.

(14)
£. s. d.
31) 39 . 1 . 5½ (1£
31
8
20
31) 161 (5s.
155
6
12
31) 77 (2d.
62
15
4
31) 62 (2q.
62

Ans. £1. 5s. 2½d.

(15)
£. s. d.
39) 12 . 18 . 4½
20
39) 258 (6s.
234
24
12
39) 292 (7d.
273
19
4
39) 78 (2q.
78

Ans. 6s. 7½d.

(16)
£. s. d.
139) 165 . 15 . 8¾ (£1
139
26
20
139) 535 (3s.
417
118
12
139) 1424 (10d.
1390
34
4
139) 139 (1q.
139

Ans. £1. 3s. ¼d.

(17)
£. s. d.
198) 62 . 1 . 7½
20
198) 1241 (6s.
1188
53
12
198) 643 (3d.
594
49
4
198) 198 (1q.
198

Ans. 6s. 3¼d.

(18)

```
       £.
  744) 2728 (£3.
       2232
        496
         20
  744) 9920 (13s.
        744
       2480
       2232
        248
         12
  744) 2976 (4d.
       2976
```

Ans. £3. 13s. 4d.

(20)

```
       £.  s. d.
   74) 37 . 3 . 1
       20
   74) 743 (10s.
       740
         3
        12
   74)  37 (0d.
         4
   74) 148 (2q.
       148
```

Ans. 10s. 0½d.

(21)

```
        £.         s.  d.
 6352) 492710 . 1 . 8 (£77.
       44464
        48070
        44464
         3606
           20
 6352)  72121 (11s.
        69872
         2249
           12
 6352)  26996 (4d.
        25408
         1588
            4
 6352)   6352 (1q.
         6352
```

Ans. £77. 11s. 4¼d.

(19)

```
       £.    s.  d.
  754) 1288 . 1 . 8 (£1.
        754
        534
         20
  754) 10681 (14s.
        754
        3141
        3016
         125
          12
  754)  1508 (2d.
        1508
```

Ans. £1. 14s. 2d.

(22)

```
       £.   s.  d.
  156) 162 . 3 . 6 (1£.
       156
         6
        20
  156) 123 (0s
        12
  156) 1482 (9d
       1404
         78
          4
  156)  312 (2q
        312
```

Ans. £1. 0s. 9½.

(23)

```
         £.          s.  d.
 9416) 130264 . 9 . 6 (13£.
        9416
        36104
        28248
         7856
           20
 9416) 157129 (16s
         9416
        62969
        56496
         6473
           12
 9416)  77682 (8d
        75328
         2354
            4
 9416)   9416 (1q
         9416
```

Ans. £13. 16s. 8¼d.

(24)

£.
2737) 1746
20
2737) 34920 (12*s*.
32844
2076
12
2737) 24912 (9*d*.
24633
279

Ans. 12*s*. $9\frac{279}{2737}$*d*.

(25)

£. s. d.
357) 2648 . 18 . 9 (7£.
2499
149
20
357) 2998 (8*s*.
2856
142
12
357) 1713 (4*d*.
1428
285
4
357) 1140 (3*q*.
1071
69

and $\frac{69}{357} = \frac{23}{119}$;

∴ *Ans.* £7. 8*s*. $4\frac{3}{4}\,.\,\frac{23}{119}$*d*.

(26)

£. s. d.
129) 344 . 0 . $8\frac{1}{4}$ (2£.
258
86
20
129) 1720 (13*s*.
129
430
387
43
12
129) 524 (4*d*.
516
8
4
33 *q*.

∴ since $\frac{33}{129} = \frac{11}{43}$,

Ans. = £2. 13*s*. 4*d*. $\frac{11}{43}$*q*.

(27)

cwt. lbs.
75) 1283 . 4 (17 cwt.
75
533
525
8
112
75) 900 (12 lbs.
900

Ans. 17 cwt. 12 lbs.

(28)

cwt. qrs. lbs.
53) 178 . 3 . 14 (3 cwt.
159
19
4
53) 79 (1 qr.
53
26
28
222
52
53) 742 (14 lbs.
53
212
212

Ans. 3 cwt. 1 qr. 14 lbs.

(29)

mo. d.
26) 206 . 4 (7 mo.
182
24
28
196
48
26) 676 (26 d.
52
156
156

Ans. 7 mo. 26 d.

(30)
d. h. m.
47) 684 . 8 . 9 (14 d.
47
214
188
26
24
112
52
47) 632 (13 h.
47
162
141
21
60
47) 1269 (27 m.
94
329
329
Ans. 14 d. 13 h. 27 m.

(33)
ac. r. p.
26) 75 . 3 . 39 (2 ac.
52
23
4
26) 95 (3 r.
78
17
40
26) 719 (27 p.
52
199
182
17
30¼
510
4¼
26) 514¼ (19 sq. yds.
26
254¼
234
20¼
9
26) 182¼ (7 sq. ft.
182
¼
144
26) 36 (1 sq. in.
26
10
Ans. 2 ac. 3 r. 27 p. 19 sq. yds.
7 sq. ft. $1\frac{5}{13}$ sq. in.

(31)
cwt. lbs. oz.
456) 15 . 27 . 11
4
60 qrs.
28
507
120
456) 1707 (3 lbs.
1368
339
16
2045
339
456) 5435 (11 oz.
5016
419
16
2514
419
456) 6704 (14 drs.
456
2144
1824
320

$\therefore$ since $\frac{320}{456} = \frac{40}{57}$,
Ans. = 3 lbs. 11 oz. $14\frac{40}{57}$ drs.

(32)
cwt.
963) 76
112
152
76
76
963) 8512 (8 lbs.
7704
808
16
4848
808
963) 12928 (13 oz.
963
3298
2889
409
16
2454
409
963) 6544 (6 drs.
5778
766
Ans. 8 lbs. 13 oz. $6\frac{766}{963}$ drs.

(34)

```
        ac.   r.
   147) 13  . 1
         4
        53 r.
        40
   147) 2120 (14 p.
        147
         650
         588
          62
          30¼
        1860
          15½
   147) 1875½ (12 s. yds.
        1764
         111½
           9
   147) 1003½ (6 s. ft.
         882
         121½
         144
         484
        484
       121
          72
   147) 17496 (119 s. inch.
        147
         279
         147
         1326
         1323
            3
```

Ans. 14 po. 12 s. yds. 6 s. ft. 119 $\frac{1}{49}$.

(35)

```
          yds.  qrs.  na.
   903)  91   .  2  .  1
          4
        366
          4
   903) 1465 (1 na.
         903
         562
```

Ans. 1 $\frac{562}{903}$ na.

(36)

```
         qrs.  bush.  pks.
   107)  97  .  3  .  3
          8
   107)  779 (7 bus.
         749
          30
           4
   107)  123 (1
         107
          16
```

Ans. 7 bus. 1 $\frac{16}{107}$ pk.

(37)

```
             £.          £.
   ·000625) 12·000000 (19200
            625
            5750
            5625
             1250
             1250
               00
```

```
             £.          £.
   ·001875) 36·000000 (19200
            1875
            17250
            16875
              3750
              3750
                00
```

Ex. XLI. (p. 117.)

(1)

$$\begin{array}{rll}
 & \text{£.}\quad s.\quad d. & \\
15) & 440\ .\ 16\ .\ 9\tfrac{1}{2} & (29\text{ £.} \\
 & 30 & \\ \hline
 & 140 & \\
 & 135 & \\ \hline
 & 5 & \\
 & 20 & \\ \hline
15) & 116 & (7s. \\
 & 105 & \\ \hline
 & 11 & \\
 & 12 & \\ \hline
15) & 141 & (9d. \\
 & 135 & \\ \hline
 & 6 & \\
 & 4 & \\ \hline
15) & 26 & (1q. \\
 & 15 & \\ \hline
 & 11 &
\end{array}$$

Or,

$$15\left\{\begin{array}{r}3\\5\end{array}\right.\begin{array}{|rrl}
\text{£.} & s. & d. \\
440 & 16 & 9\tfrac{1}{2} \\ \hline
146 & 18 & 11\ .\ \tfrac{2}{3} \\ \hline
29 & 7 & 9\tfrac{1}{4}\cdot\tfrac{11}{15}
\end{array}$$

(2)

$$\begin{array}{rll}
 & \text{£.}\quad s.\quad d. & \\
32) & 678\ .\ 19\ .\ 9\tfrac{3}{4} & (21\text{ £.} \\
 & 64 & \\ \hline
 & 38 & \\
 & 32 & \\ \hline
 & 6 & \\
 & 20 & \\ \hline
32) & 139 & (4s. \\
 & 128 & \\ \hline
 & 11 & \\
 & 12 & \\ \hline
32) & 141 & (4d. \\
 & 128 & \\ \hline
 & 13 & \\
 & 4 & \\ \hline
32) & 55 & (1q. \\
 & 32 & \\ \hline
 & 23 &
\end{array}$$

Or thus:

$$32\left\{\begin{array}{r}4\\8\end{array}\right.\begin{array}{|rrl}
\text{£.} & s. & d. \\
678 & 19 & 9\tfrac{3}{4} \\ \hline
169 & 14 & 11\tfrac{1}{4}\ .\ \tfrac{3}{4} \\ \hline
21 & 4 & 4\tfrac{1}{4}\cdot\tfrac{23}{32}
\end{array}$$

(3)

$$\begin{array}{rll}
 & \text{£}\quad s.\quad d. & \\
99) & 123\ .\ 13\ .\ 0\tfrac{3}{4} & (1\text{£.} \\
 & 99 & \\ \hline
 & 24 & \\
 & 20 & \\ \hline
99) & 493 & (4s. \\
 & 396 & \\ \hline
 & 97 & \\
 & 12 & \\ \hline
99) & 1164 & (11d. \\
 & 1089 & \\ \hline
 & 75 & \\
 & 4 & \\ \hline
99) & 303 & (3q. \\
 & 297 & \\ \hline
 & 6 &
\end{array}$$

Or thus:

$$99\left\{\begin{array}{r}11\\9\end{array}\right.\begin{array}{|rrl}
\text{£.} & s. & d. \\
123 & 13 & 0\tfrac{3}{4} \\ \hline
11 & 4 & 9\tfrac{3}{4}\cdot\tfrac{6}{11} \\ \hline
1 & 4 & 11\tfrac{3}{4}\cdot\tfrac{2}{33}
\end{array}$$

(4)

$$\begin{array}{rll}
 & \text{£.}\quad s. & \\
96) & 236\ .\ 17 & (2\text{ £.} \\
 & 192 & \\ \hline
 & 44 & \\
 & 20 & \\ \hline
96) & 897 & (9s. \\
 & 864 & \\ \hline
 & 33 & \\
 & 12 & \\ \hline
96) & 396 & (4d. \\
 & 384 & \\ \hline
 & 12 &
\end{array}$$

Or thus:

$$96\left\{\begin{array}{r}12\\8\end{array}\right.\begin{array}{|rrl}
\text{£.} & s. & d. \\
236 & 17 & 0 \\ \hline
19 & 4 & 9 \\ \hline
2 & 9 & 4\ .\ \tfrac{1}{8}
\end{array}$$

(5)

£. s. d.
18) 371 . 2 . $9\frac{1}{4}$ (£20.
36
11
20
18) 222 (12*s*.
216
6
12
18) 81 (4*d*.
72
9
4
18) 37 (2*q*.
36
1

Or thus:

		£.	s.	d.
18	2	371	2	$9\frac{1}{4}$
	9	185	11	$4\frac{1}{2} . \frac{1}{2}$
		20	12	$4\frac{1}{2} . \frac{1}{18}$

(6)

£. s. d.
42) 315 . 11 . $7\frac{1}{4}$ (£7.
294
21
20
42) 431 (10*s*.
420
11
12
42) 139 (3*d*.
126
13
4
42) 53 (1*q*.
42
11

Or thus:

		£.	s.	d.
42	6	315	11	$7\frac{1}{4}$
	7	52	11	$11 . \frac{5}{6}$
		7	10	$3\frac{1}{4} . \frac{11}{42}$

(7)

£. s. d.
132) 972 . 15 . $10\frac{1}{2}$ (£7.
924
48
20
132) 975 (7*s*.
924
51
12
132) 622 (4*d*.
528
94
4
132) 378 (2*q*.
264
114

and $\frac{114}{132} = \frac{19}{22}$.

Or thus:

		£.	s.	d.
132	12	972	15	$10\frac{1}{2}$
	11	81	1	$3\frac{3}{4} . \frac{1}{2}$
		7	7	$4\frac{1}{2} . \frac{19}{22}$

(8)

£. s. d.
198) 860 . 11 . $1\frac{1}{4}$ (£4.
792
68
20
198) 1371 (6*s*.
1188
183
12
198) 2197 (11*d*.
2178
19
4
77

and $\frac{77}{198} = \frac{7}{18}$.

Or thus:

		£.	s.	d.
198	2	860	11	$1\frac{1}{4}$
	11	430	5	$6\frac{1}{2} . \frac{1}{2}$
	9	39	2	$3\frac{3}{4} . \frac{1}{2}$
		4	6	$11 . \frac{7}{18}$

(9)

£. s. d.
108) 2016 . 2 . $2\frac{1}{4}$ (£18.
108
936
864
72
20
108) 1442 (13s.
108
362
324
38
12
108) 458 (4d.
432
26
4
105

and $\frac{105}{108}=\frac{35}{36}$.

Or thus:

£. s. d.
108 {12 | 2016 2 $2\frac{1}{4}$
9 | 168 0 $2-\frac{3}{4}$
18 13 $4-\frac{35}{36}$

(10)

£. s. d.
528) 3363 . 0 . $11\frac{3}{4}$ (£6.
3168
195
20
528) 3900 (7s.
3696
204
12
528) 2459 (4d.
2112
347
4
528) 1391 (2q.
1056
335

Or thus:

£. s. d.
528 {4 | 3363 0 $11\frac{3}{4}$
12 | 840 15 $2\frac{3}{4}\cdot\frac{3}{4}$
11 | 70 1 $3-\frac{47}{48}$
6 7 $4\frac{1}{2}\cdot\frac{335}{528}$

Ex. XLII. (p. 119.)

(1)
£. s. d.
39·6 . 9 . 2
20
s. 12·9
12
d. 11·0

Ans. £39. 12s. 11d.

(2)
£. s.
17·87 . 10s.
20
s. 17·50
12
d. 6·00

Ans. £17. 17s. 6d.

(3)
£.
2·025
20
s. ·500
12
6·000

Ans. £2. 0s. 6d.

(4)
£. s. d.
1·447 . 18 . 4
20
s. 8·958
12
d. 11·500
4
q. 2·000

Ans. £1. 8s. $11\frac{1}{2}$d.

(5)
£. s. d.
24 {4 | 262 10 0
6 | 65 12 6
£ ·10 18 9
20
s. 2·18
12
d. 2·25
4
q. 1·00

Ans. 2s. $2\frac{1}{4}$d.

(6)
£. s. d.
25 {5 | 26380 4 2
5 | 5276 0 10
£. 1·055 4 2
20
s. 1·104
12
d. 1·250
4
q. 1·000

Ans. £1. 1s. $1\frac{1}{4}$d.

(7)
ac. ro. po.
21 3 17
2
·43 . 2 . 34
4
ro. 1·74
40
po. 29·94
Ans. 1ro. 29·94po.

£. s.
375 . 3
20
7503
·0507
5 2521
375 15
s. 380·4021
12
d. 4·8252
4
q. 3·3008
Ans. £19. 0*s.* 4¾*d.* ·3008.

(8)
ac. ro. po.
24 3 10
2
49 2 20
8
397 0 0
7
ac. 2779 0 0 for 112.

ac.
277·9 for 11·2
4
ro. 3·6
40
po. 24·0
Ans. 277ac. 3ro. 24po.

Ex. XLIII. (p. 120.)

(1)
s. d.
1 . 4½
12
16
2
33

£. s. d.
2 . 12 . 3
20
52
12
627
2
$33\begin{cases}3 & \underline{1254} \\ 11 & \underline{418}\end{cases}$
Ans. 38.

(3)
£. s. d.
1 . 10 . 6¼
20
30
12
366
4
1465

£. s. d.
160 . 4 . 8¼
20
3204
12
38456
4
1465) 153825 (105 *Ans.*
1465
7325
7325

(2)
£. s. d.
2 . 8 . 7¾
20
48
12
583
4
2335

£. s. d.
55 . 18 . 10¼
20
1118
12
13426
4
2335) 53705 (23 *Ans.*
4670
7005
7005

(4)
£. s. d.
2 . 11 . 5¼
20
51
12
617
4
2469

£. s. d.
401 . 4 . 3
20
8024
12
96291
4
2469) 385164 (156 *Ans.*
2469
13826
12345
14814
14814

(5)
cwt. qrs. lbs.
1 . 2 . 17
4
6
28
185

cwt. qrs. lbs.
44 . 2 . 11
4
178
28
1435
356
185) 4995 (27 *Ans.*
370
1295
1295

(6)
yds. qrs. na.
7 . 2 . 1
4
30
4
121

yds. qr.
272 . 1
4
1089
4
121) 4356 (36 *Ans.*
363
726
726

(7)
bus. pks.
143 . 3
4
175

bus. pks.
9487 . 2
4
175) 37950 (66 *Ans.*
3450
3450
3450

(8)
ac. ro. po.
4 . 3 . 27
4
19
40
787

ac. ro. po.
1416 . 2 . 16
4
5666
40
787) 226656 (288 *Ans.*
1574
6925
6296
6296
6296

(9)
fur. yds. ft. in.
7 . 87 . 1 . 5
220
1627
3
4882
12
58589

lea. mi. yds.
57 . 19 . 56
3
172
1760
10320
1204
172
956
303676
3
911028
12
58589) 10932336 (186
58589
507343
468712
386316
351534
34782

∴ *Ans.* = $186\frac{34782}{58589}$.

(10)
qrs. pk.
12 . 1
8
96 bus.
4
385

lds. qr.
617 . 1
5
3086
8
24688
4
385) 98752 (256
770
2175
1925
2502
2310
192

∴ *Ans.* = $256\frac{192}{385}$.

Ex. XLIV. (p. 121.)

(1)

$$\begin{array}{llll} \text{£.} & \text{s.} & \text{d.} & \\ 13 & 12 & 11\frac{1}{4} \times 2 = & \end{array} \begin{array}{lll} \text{£.} & \text{s.} & \text{d.} \\ 27 & 5 & 10\frac{1}{2} \end{array}$$

$$\frac{13 \quad 12 \quad 11\frac{1}{4} \times 7}{9} = 10 \quad 12 \quad 3\frac{1}{4} \cdot \frac{2}{3}$$

$$\textit{Ans.} = 37 \quad 18 \quad 1\frac{3}{4} \cdot \frac{2}{3}$$

(2)

$$\begin{array}{lllcrrr} \text{£.} & \text{s.} & \text{d.} & & \text{£.} & \text{s.} & \text{d.} \\ 7 & 0 & 0\frac{4}{5}\times 3 & = & 21 & 0 & 2\frac{2}{5} \\ \multicolumn{3}{c}{\dfrac{7 \quad 0 \quad 0\frac{4}{5}\times 4}{5}} & = & 5 & 12 & 0\frac{16}{25} \\ \cline{5-7} & & & \textit{Ans.} = & 26 & 12 & 3\frac{1}{25} \end{array}$$

(3)

$$\begin{array}{lllcrrr} \text{£.} & \text{s.} & \text{d.} & & \text{£.} & \text{s.} & \text{d.} \\ 40 & 11 & 6\frac{3}{8}\times 57 & = & 2312 & 17 & 3\frac{3}{8} \\ 40 & 11 & 6\frac{3}{8}\div 20 & = & 2 & 0 & 6\frac{147}{160} \\ \cline{5-7} & & & \textit{Ans.} & 2314 & 17 & 10\frac{47}{160} \end{array}$$

(4)

$$\begin{array}{lllcrrrr} \text{ro.} & \text{po.} & \text{yds.} & & \text{ac.} & \text{ro.} & \text{po.} & \text{yds.} \\ 3 & 35 & 27\frac{1}{2}\times 81 & = & 78 & 3 & 28 & 19\frac{1}{4} \\ 3 & 35 & 27\frac{1}{2}\div 2 & = & & 1 & 37 & 28\frac{7}{8} \\ \cline{5-8} & & & \textit{Ans.} & 79 & 1 & 26 & 17\frac{7}{8} \end{array}$$

(5)

$$\begin{array}{llllcrrrr} \text{mi.} & \text{fur.} & \text{po.} & \text{yds.} & & \text{mi.} & \text{fur.} & \text{po.} & \text{yds.} \\ 4 & 3 & 37 & 4\frac{1}{5}\times 5 & = & 22 & 3 & 28 & 4\frac{1}{2} \\ 4 & 3 & 37 & 4\frac{1}{5}\times \frac{5}{7} & = & 3 & 1 & 26 & 5\frac{5}{14} \\ \cline{6-9} & & & & \textit{Ans.} & 25 & 5 & 15 & 4\frac{5}{14} \end{array}$$

(6)

$$\begin{array}{lllcrrr} \text{tons} & \text{cwt.} & \text{lbs.} & & \text{tons} & \text{cwt.} & \text{lbs.} \\ 84 & 13 & 3\times 23 & = & 1946 & 19 & 69 \\ \multicolumn{3}{c}{\dfrac{84 \quad 13 \quad 3\times 5}{9}} & = & 47 & 0 & 63\frac{8}{9} \\ \cline{5-7} & & & \textit{Ans.} & 1994 & 0 & 20\frac{8}{9} \end{array}$$

(7)

$$\begin{array}{lllcrrlcrrr} \text{£.} & \text{s.} & \text{d.} & & \text{£.} & \text{s.} & \text{d.} & & \text{£.} & \text{s.} & \text{d.} \\ 50 & 10 & 7\div\frac{1}{8} & = & 50 & 10 & 7\times 8 & = & 404 & 4 & 8 \end{array}$$

(8)

$$\begin{array}{rr|rrr} & & \text{cwt.} & \text{qrs.} & \text{lbs.} \\ & & 597 & 2 & 8 \\ & & & & 3 \\ \cline{3-5} & 5 & 1792 & 2 & 24 \\ \cline{3-5} 40\{ & 8 & 358 & 2 & 4\frac{4}{5} \\ \cline{3-5} \textit{Ans.} & & 44 & 3 & 7\frac{3}{5} \end{array}$$

(9)

$$\begin{array}{rr|rrr} & & \text{£.} & \text{s.} & \text{d.} \\ & & 9 & 9 & 7\frac{5}{16} \\ & & & & 4 \\ \cline{3-5} & 5 & 37 & 18 & 5\frac{1}{4} \\ \cline{3-5} 15\{ & 3 & 7 & 11 & 8\frac{1}{4} \\ \cline{3-5} \textit{Ans.} & & 2 & 10 & 6\frac{3}{4} \end{array}$$

(10)
yrs. mo.
6491 8
11
4133) 71408 4 (17 yrs.
4133
30078
28931
1147
12
4133) 13768 (3 mo.
12399
1369
4
4133) 5476 (1 wk.
4133
1343
7
4133) 9401 (2 dys.
8266
1135
24
4540
2270
4133) 27240 (6 hrs.
24798
2442

Ans. 17yrs. 3mo. 1wk. 2dys. $6\frac{2442}{4133}$hrs.

(11) Since $12\frac{10}{12} = 12\frac{5}{6} = \frac{77}{6}$.

		£.	s.	d.
		20	18	$2\frac{157}{310}$
				6
77	11	125	9	$3\frac{6}{155}$
	7	11	8	$1\frac{626}{1705}$
	Ans.	1	12	$7\frac{626}{11935}$

(12)
yds. qrs. na.
571 2 1
7
166) 4000 . 3 . 3 (24 yds.
332
680
664
16
4
67 qrs.
4
166) 271 (1 na.
166
105

Ans. 24 yds. $1\frac{105}{166}$ na.

Ex. XLV. (p. 127).

(1)
£. fl.
15 . 6
10
156 fl.
10
1560 c.
10
15600 m.

fl. c. m.
6 . 3 . 2
10
63·2 c.
10
632 m.

(2)
£. fl.
30 . 9.5
10
309·5 fl.
10
3095 c.
10
30950 m.

£. fl. c. m.
96 . 1 . 2 . 9
10
961·29 fl.
10
9612·9 c.
10
96129 m.

(3)
£. fl. c.
18 . 0 . 6·5
10
180·65 fl.
10
1806·5 c.
10
18065 m.

fl.
9·25
10
92·5 c.
10
925 m.

(4)
$$\begin{array}{l}
\text{£.}\quad \textit{fl.}\quad \textit{c.}\quad \textit{m.}\\
10\ .\ 0\ .\ 0\ .\ 1\\
\underline{10}\\
\underline{100{\cdot}01}\ \textit{fl.}\\
\underline{10}\\
\underline{1000{\cdot}1}\ \textit{c.}\\
\underline{10}\\
10001\ \textit{m.}
\end{array}
\qquad\qquad
\begin{array}{l}
\text{£.}\quad \textit{fl.}\quad \textit{c.}\\
46\ .\ 0\ .\ 2{\cdot}5\\
\underline{10}\\
\underline{460{\cdot}25}\ \textit{fl.}\\
\underline{10}\\
\underline{4602.5}\ \textit{c.}\\
\underline{10}\\
46025\ \textit{m.}
\end{array}$$

Ex. XLVI. (p. 129.)

1. (1)
$$\begin{array}{r}
\text{£.}\\
76{\cdot}853\\
27{\cdot}909\\
84{\cdot}01\\
56{\cdot}362\\
\underline{19{\cdot}001}\\
264{\cdot}135
\end{array}$$

Ans. £264. 1*f.* 3*c.* 5*m.*

(2)
$$\begin{array}{r}
\text{£.}\\
252{\cdot}25\\
300{\cdot}025\\
{\cdot}45\\
\underline{{\cdot}052}\\
552{\cdot}777
\end{array}$$

Ans. £552. 7*f.* 7*c.* 7*m.*

2. (1)
$$\begin{array}{r}
\text{£.}\\
19{\cdot}5\\
\underline{16{\cdot}39}\\
3{\cdot}11
\end{array}$$

Ans. £3. 1*f.* 1*c.*

(2)
$$\begin{array}{r}
\text{£.}\\
20{\cdot}\\
\underline{19{\cdot}999}\\
{\cdot}001
\end{array}$$

Ans. 1*m.*

(3)
$$\begin{array}{r}
\text{£.}\\
5{\cdot}55\\
\underline{4{\cdot}045}\\
1{\cdot}505
\end{array}$$

Ans. £1. 5*f.* 5*m.*

3. (1)
$$\begin{array}{r}
\text{£.}\\
76{\cdot}803\\
\underline{5}\\
384{\cdot}015
\end{array}$$

Ans. £384. 1*c.* 5*m.*

$$\begin{array}{r}
\text{£.}\\
76{\cdot}803\\
\underline{63}\\
230409\\
\underline{460818}\\
4838{\cdot}589
\end{array}$$

Ans. £4838. 5*f.* 8*c.* 9*m.*

(2)
$$\begin{array}{r}
\text{£.}\\
{\cdot}925\\
\underline{18}\\
7400\\
\underline{925}\\
16{\cdot}650
\end{array}$$

Ans. £16. 6*f.* 5*c.*

$$\begin{array}{r}
\text{£.}\\
{\cdot}925\\
\underline{1008}\\
7400\\
\underline{925}\\
932{\cdot}400
\end{array}$$

Ans. £932. 4*f.*

(3)
$$\begin{array}{r}
\text{£.}\\
150{\cdot}005\\
\underline{2005}\\
750025\\
\underline{300010}\\
300760{\cdot}025
\end{array}$$

Ans. £300760. 2*c.* 5*m.*

$$\begin{array}{r}
\text{£.}\\
150{\cdot}005\\
\underline{18576}\\
900030\\
1050035\\
750025\\
1200040\\
\underline{150005}\\
2786492{\cdot}880
\end{array}$$

Ans. £2786492. 8*f.* 8*c.*

4. (1)
$$\begin{array}{r|l}
 & \text{£.}\\
5 & \underline{194{\cdot}575}\\
 & 38{\cdot}915
\end{array}$$

Ans. £38. 9*f.* 1*c.* 5*m.*

(2)
$$\begin{array}{r|l}
 & \text{£.}\\
11 & \underline{10764{\cdot}204}\\
 & 978{\cdot}564
\end{array}$$

Ans. £978. 5*f.* 6*c.* 4*m.*

(3) $7380)\ \overset{£.}{342136{\cdot}8}\ (46{\cdot}36$

29520

46936

44280

26568

22140

44280

44280

Ans. £46. 3*f.* 6*c.*

Ex. XLVII. (p. 129.)

Miscellaneous Examples.

I.

(1) $\overset{\text{hf-guin.}}{537983} = \overset{\text{s.}}{5648821\tfrac{1}{2}} = \overset{\text{seven sh. pieces}}{806974\tfrac{1}{2}}$

and $\overset{\text{seven sh. pieces}}{806974\tfrac{1}{2}} \times 21 = \overset{\text{groats}}{16946464\tfrac{1}{2}}$

(3)

£.	s.	d.	
1	18	6½	
		10	
19	5	5	for 10
		10	
192	14	2	for 100
		10	
1927	1	8	for 1000
		10	
19270	16	8	for 10000
5781	5	0	for 3000
1348	19	2	for 700
96	7	1	for 50
£26497	7	11	for 13750

(4) $\overset{£.}{26}\ \ \overset{s.}{14} = \overset{d.}{6408}$, and a noble $= \overset{d.}{80}$

$$\therefore \frac{6408}{80} = 80\tfrac{1}{10}.$$

(5)

£.	s.	d.	
	1	7½	= profit on each yard
		10	
	s. 16	3	for 10 yards
		10	
£8	2	6	for 100
		10	
81	5	0	for 1000
56	17	6	for 700
4	17	6	for 60
	4	10½	for 3
£143	4	10½	for 1763.

(6) £14. × 52 = $\overset{£.}{728}$ year's income,

£128. 10*s.* × 4 = 514 year's expenses,

214 saving each year,

8

£1712 *Ans.*

(7) $\overset{s.}{21} + \overset{s.}{20} + \overset{s.}{10}\ .\ \overset{d.}{6} + \overset{s.}{5} + \overset{s.}{2}\ .\ \overset{d.}{6} = \overset{s.}{59}$

$\overset{£.}{398}\ .\ \overset{s.}{5} = \overset{s.}{7965}$;

$$\therefore\ \textit{Ans.} = \frac{7965}{59} = 135.$$

(8) By selling £90 worth of the mixture at 10*s.* a gallon, I must have 180 gallons of it; and since there are 126 gallons in a pipe, I must add (180 − 126) gallons = 54 gallons of water.

II.

(1)
$$49\left\{\begin{array}{l}7\\7\end{array}\right.\begin{array}{|r}\text{£.}\quad\ \ s.\quad\ d.\\ \hline 1844\ .\ \ 2\ .\ \ 8\tfrac{1}{2}\\ \hline 263\ .\ \ 8\ .\ 11\tfrac{1}{2}\\ \hline 37\ .\ 12\ .\ \ 8\tfrac{1}{2}\end{array}$$

(2)
$$\begin{array}{r|rl} & \text{£.}\quad s.\quad d. & \\ 9 & 6734\ .\ 5\ .\ 9 & \\ \hline & 748\ .\ 5\ .\ 1 & \text{value of furniture}\\ & 8 & \\ \hline & 5986\ .\ 0\ .\ 8 & \text{value of house.}\end{array}$$

(3)
$$\begin{array}{rl|rl} & & \text{cub. in.} & \\ & 12 & 4203239040 & \\ 1728 & 12 & 350269920 & \\ & 12 & 29189160 & \\ 27 & 3 & 2432430 & \text{cub. ft.}\\ & 9 & 810810 & \\ \hline & & 90090 & \text{cub. yds.}\end{array}$$

also 1 load = 2560 pints, and 2560 pints × 7000 = 17920000 grains.

(4)
$$\begin{array}{r|r}&\text{£.}\quad s.\quad d.\\ 5 & 3\ .\ 13\ .\ 9\\ \hline & 14\ .\ 9\end{array}\qquad \text{therefore}\ \begin{array}{l} \quad s.\quad d.\qquad\quad \text{£.}\ \ s.\ \ d.\\ 14\ .\ 9\times 3=2\ .\ 4\ .\ 3\\ 14\ .\ 9\times 2=1\ .\ 9\ .\ 6\end{array}$$

(5) 834 guineas = £834 + £41 14*s.* = £875 14*s.*,

(1429 × 4½)*s.* = 6430½*s.* = £321 10*s.* 6*d.*;

therefore, there remains £554 3*s.* 6*d.*

(6) For every 2*s.* 2¾*d.* of tax there is £1 of property,

now £974 16*s.* 3½*d.* = 935822*q.*,

and 2*s.* 2¾*d.* = 107*q.*,

and since $\frac{935822}{107} = 8746$;

therefore, property is worth £8746.

(7)
$$\overset{\text{pipes}}{\tfrac{2}{3}\text{ of }2} = \overset{\text{galls.}}{\frac{4\times 126}{3}} = \overset{\text{galls.}}{4\times 42} = \overset{\text{quarts}}{4\times 42\times 4} = \overset{\text{doz.}}{\frac{4\times 42\times 4}{12}} = \overset{\text{doz.}}{56},$$

$$\text{and } \overset{\text{pipes}}{\tfrac{1}{3}\text{ of }2} = \overset{\text{galls.}}{2\times 42} = \overset{\text{pts.}}{2\times 42\times 8} = \overset{\text{doz.}}{\frac{2\times 42\times 8}{12}} = \overset{\text{doz.}}{7\times 8} = \overset{\text{doz.}}{56}.$$

(8)
$$\begin{array}{r l} & \pounds.\ \ s. \\ & 10\ .\ 8 \\ & 20 \\ \cline{2-2} 52) & 208\ (4s. \\ & 208 \\ \cline{2-2} \end{array}$$

$\therefore$ 4*s*. × 7 = 28*s*. *Ans.*

III.

(1)
$$\begin{array}{r r|l} & & \text{lbs. Av.} \\ & & 56 \\ & & 7000 \\ \cline{3-3} 24 & \left\{\begin{array}{r} 6 \\ 4 \end{array}\right. & \begin{array}{l} 392000-2 \\ \hline 65333-1 \end{array} \Big\} \text{ 8 grs.} \\ \cline{3-3} & 2,0 & 1633,3-13 \text{ dwts.} \\ \cline{3-3} & 12 & 816 \\ \cline{3-3} & & 68 \end{array}$$

lbs. dwts. grs.
Ans. 68 . 13 . 8.

(2) £1569 17*s*. 4*d*. = 376768*d*.,
4*s*. 10*d*. = 58*d*.;

therefore, number of yards in each piece

$$=\frac{376768}{58\times 56}=\frac{6496}{56}=\frac{928}{8}=116.$$

(3)

farthings.
1 half-sovereign = 10 × 12 × 4 = 480
1 half-crown = 30 × 4 = 120
1 sixpence = 6 × 4 = 24
1 half-penny = 1 × 2 = 2
626
5
farthings 3130

(4) $6\frac{1}{2}d. + 1\frac{1}{4}d. = 7\frac{3}{4}d.$ whole cost per lb.,
$7\frac{3}{4}d. \times 112 =$ £3, 12*s*. 4*d*. cost per cwt.;
$\therefore$ £4 10*s*. − £3 12*s*. 4*d*. = 17*s*. 8*d*. *Ans.*

(6) Reckoning 365 days in 1851, we find his expenses were £593 2*s*. 6*d*., and therefore his income was £593 2*s*. 6*d*. + £294 1*s*. 6*d*. = £887 4*s*.

(7) If the first person has 1 share,
the second person must have 2 shares,
.. third .... 6 ......,
.. fourth .... 24......;

therefore, dividing the whole into (24 + 6 + 2 + 1) or 33 shares,

$$\text{we have } \frac{198}{33}=\frac{66}{11}=6 \text{ guineas;}$$

therefore, 6, 12, 36, 144, are the numbers.

(8)

$$\begin{array}{r@{\,}l}
\text{m.} & \\
625 & = \text{railway fare} \\
125 & = \text{cab fare} \\
1350 & = \text{hotel bill} \\
\hline
2100 & = \text{expenses}
\end{array}$$

$\therefore$ 5791 m. − 2100 m. = 3691 m. = £3 6f. 9c. 1m. *Ans.*

IV.

(2)

$$\begin{aligned}
\text{Age of one} + \text{age of other} &= 51 \text{ years,} \\
\text{age of one} - \text{age of other} &= 23 \text{ years;} \\
\text{therefore, twice age of one} &= 74 \text{ years,} \\
\text{therefore, age of one} &= \frac{74}{2} \text{ years} = 37 \text{ years,} \\
\text{age of other} &= (51-37) \text{ years} = 14 \text{ years.}
\end{aligned}$$

(3)

$$3s.\ 4\tfrac{1}{2}d. = 162q.;\quad 15s.\ 9\tfrac{3}{4}d. = 759q.$$

$$\therefore\ \textit{Ans.} = \frac{378 \times 759}{162} = 7 \times 253 = 1771.$$

(4)

$$\text{Value of each} = \overset{s.}{\frac{95 \times 20}{100}} = \overset{s.}{\frac{95}{5}} = \overset{s.}{19}.$$

(5) 1.

$$\begin{array}{rcccc}
\text{£.} & \text{f.} & \text{c.} & \text{m.} \\
27\ . & 0\ . & 3\ . & 9 \\
560\ . & 2\ . & 5\ . & 0 \\
30\ . & 0\ . & 3\ . & 7 \\
\hline
\text{£}617\ . & 3\ . & 2\ . & 6
\end{array}$$

2.

$$16 \begin{cases} 4 \\ 4 \end{cases}
\begin{array}{|rccc}
\text{£.} & \text{f.} & \text{c.} & \text{m.} \\
405\ . & 5\ . & 3\ . & 6 \\
\hline
101\ . & 3\ . & 8\ . & 4 \\
\hline
\multicolumn{1}{r}{\text{£}25\ .} & 3\ . & 4\ . & 6
\end{array}$$

(6)

$$\begin{aligned}
\text{£}43\ 9s.\ 4d. &= 10432d., \\
5s.\ 4d. &= 64d. \\
\therefore\ \frac{10432}{64} &= 163 \text{ galls. bought.} \\
\text{Also £}54 &= 432 \text{ half-crowns,} \\
7s.\ 6d. &= 3 \text{ half-crowns;} \\
\therefore\ \frac{432}{3} &= 144 \text{ galls. sold;} \\
\therefore\ 163 - 144 &= 19 \text{ galls. leaked.}
\end{aligned}$$

(7)
$$\begin{array}{r}
\text{ac.}\ \ \text{ro.} \\
24\ .\ 0 \\
\underline{17\ .\ 3} \\
6\ .\ 1 \\
\underline{4} \\
25\ \text{ro.} \\
\underline{40\phantom{\ \text{ro.}}} \\
1000\ \text{po.}
\end{array}$$

(8)
$$\begin{array}{r}
\text{days.}\ \ \text{hrs.}\ \ \ \ \text{hrs.} \\
365\ .\ 6 = 8766 \\
\\
8766 \\
\underline{1851} \\
8766 \\
43830 \\
70128 \\
\underline{8766} \\
16225866\ \text{hours.}
\end{array}$$

V.

(2) 25000 miles = $(25000\times 1760\times 3\times 12\times 3)$ = 4752000000 barleycorns.

(3) (3*s*. 7*d*.) × 12 = 43*s*. cost of one dozen,

£86 10*s*. = 1730*s*.;

$$\therefore\ \frac{1730}{43} = 40\tfrac{10}{43}\ \text{dozen.}$$

(4) $(17s.\,6d.)\times 3549 = \frac{7}{8}\,£\times 3549 = \frac{24843}{8}\,£ = £3105\ 7s.\ 6d.$ what he pays.

(5) Number of guineas $= \dfrac{16\frac{1}{4}\times 253}{21} = \dfrac{65\times 253}{21\times 4} = \dfrac{16445}{84} = 195\tfrac{65}{84}$.

(6) It makes $2\frac{1}{2}$ vibrations in one second;

therefore, in 24 hours it makes $24\times 60\times 60\times 2\frac{1}{2} = 216000$ vibrations.

(7)
$$\begin{array}{rl}
 & £.\ \ \ \ s.\ \ \ d. \\
247) & 619\ .\ 11\ .\ 2\ (2£ \\
 & \underline{494} \\
 & 125 \\
 & \underline{20} \\
247) & 2511\ (10s. \\
 & \underline{2470} \\
 & 41 \\
 & \underline{12} \\
247) & 494\ (2d. \\
 & \underline{494}
\end{array}$$

therefore, £2 10*s*. 2*d*. = price per gall. with duty,

$$\begin{array}{r|l}
 & £\ \ \ s.\ \ \ d. \\
8 & 2\ .\ 10\ .\ 2 \\ \hline
 & 6\ .\ 3\tfrac{1}{4}\ \text{duty per gall.}
\end{array}$$

(8)
$$\begin{array}{r}
£.\ \ \ \text{c.}\ \ \ \text{m.}\qquad\qquad £.\ \ \ \text{f.}\ \ \ \text{c.}\ \ \ \text{m.} \\
(23\ .\ 4\ .\ 6)\times 12 = 276\ .\ 5\ .\ 5\ .\ 2 \\
(18\ .\ 0\ .\ 1)\times\ 6 = \underline{108\ .\ 0\ .\ 0\ .\ 6} \\
\text{amount} = 384\ .\ 5\ .\ 5\ .\ 8
\end{array}$$

VI.

(1)

£. s. d.
2793461) 130524465 . 4 . 6 (46£.
11173844
18786025
16760766
2025259
20
2793461) 40505184 (14*s*.
2793461
12570574
11173844
1396730
12
2793461) 16760766 (6*d*.
16760766

Ans. £46 14*s*. 6*d*.

(2) 1 mi. 467 yds. 1 ft. = 6682 ft., and $\frac{6682}{514}$ = 13 ft. = 4 yds. 1 ft.

(3)

£.	*s.*	*d.*	
0	16	4½	
		10	
8	3	9	for 10
		10	
81	17	6	for 100
		4	
327	10	0	for 400
40	18	9	for 50
4	1	10½	for 5
£372	10	7½	for 455

(4) Half a ton = 1120 lbs.;

$\therefore$ $(1120 \times 7\frac{1}{2})d. = (560 \times 15)d. = £\,\frac{560 \times 15}{12 \times 20} = £35$;

$\therefore$ he gains $(35 - 30)£ = £5$.

(5)

galls.		*s.*	£.	*s.*	*d.*
10	cost	10 × 12 =	6	0	0
15	"	15 × 14½ =	10	17	6
18	"	18 × 15¾ =	14	3	6
43			31	1	0
			2	5	6
			33	6	6

therefore, he must sell the mixture at the rate of

$$\frac{£33\ 6s.\ 6d.}{43} = 15s.\ 6d. \text{ per gall.}$$

(6) By the question, 16 women's shares = 48 children's,

12 men's shares = 72 children's;

therefore, we may take the money to be divided among

(30 + 48 + 72) children = 150 children.

Now $(£4\ 15s.) \div 150 = \frac{825}{150}s. = 5s.\ 6d.$ child's share;

$\therefore\ (5s.\ 6d.) \times 3 = 16s.\ 6d.$ woman's share,

$(5s.\ 6d.) \times 6 = £1\ 13s.\ 0d.$ man's share.

(7) 1 linear yard $= \frac{50}{11}$ links, 1 square yard $= \frac{50 \times 50}{11 \times 11}$ links,

1 acre = 4840 sq. yds. $= \left(\frac{50 \times 50}{11 \times 11} \times 4840\right)$ sq. links = 100000 sq. links.

(8) $£2\ 2s. + £1\ 1s. + 14s. = £3\ 17s. = 77s.$, $£1636\ 5s. = 32725s.$;

therefore, he will have $\frac{32725}{77} = \frac{4675}{11} = 425$ qrs. of each.

VII.

(1) 1852, 1856, 1860 being leap years,

number of days in the 10 years = (10 × 365 + 3) days = 3653 days;

$\therefore$ (3653 × 24 × 60) min. = (87672 × 60) min. = 5260320 minutes.

(2)
$$27\left\{\begin{matrix}3\\9\end{matrix}\right.\begin{array}{|c}\text{tons. cwt. qrs. lbs.}\\ \hline 425\ .\ 15\ .\ 2\ .\ 12\\ \hline 141\ .\ 18\ .\ 2\ .\ 4\\ \hline 15\ .\ 15\ .\ 1\ .\ 16\end{array}\qquad 28\left\{\begin{matrix}4\\7\end{matrix}\right.\begin{array}{|c}\text{mi. fur. po.}\\ \hline 1361\ .\ 4\ .\ 28\\ \hline 340\ .\ 3\ .\ 7\\ \hline 48\ .\ 5\ .\ 1\end{array}$$

198 guineas = (198 × 21)s., 1 moidore = 27s.;

therefore, number of moidores $= \frac{198 \times 21}{27} = 154$.

(3) 110 yards are contained 16 times in 1760 yards;

$\therefore\ 5 \times 16 = 80$ feet $= 26\frac{2}{3}$ yards.

(4) Number of seconds $= \frac{20000000000000}{192000}$;

therefore, number of days $= \frac{20000000000}{192 \times 60 \times 60 \times 24} = \frac{200000000}{192 \times 6 \times 6 \times 24}$

$= \frac{25000000}{192 \times 6 \times 6 \times 3} = \frac{6250000}{192 \times 27} = \frac{781250}{24 \times 27} = \frac{390625}{12 \times 27}$

$= \frac{390625}{324} = 1205\frac{205}{324}$.

(5) (£100 2*s.* 6*d.*) ÷ 45 = £2 4*s.* 6*d.* share of each,

(£2 4*s.* 6*d.*) × 20 = £44 10*s.* share of 20,

£100 2*s.* 6*d.* − £44 10*s.* = £55 12*s.* 6*d.* to be divided among 15;

∴ (£55 12*s.* 6*d.*) ÷ 15 = £3 14*s.* 2*d.* share of each.

(6)

guineas.	£.	
12000 =	12600	share of third son,
1500 =	1575	
	14175	share of second son,
	5000	
	19175	share of eldest son;

and £19175 + £14175 + £12600 = £45950 sum left by the father.

(7) (8*s.* 6*d.*) × 128 = £54 8*s.* cost of wine,

£54 8*s.* + £5 12*s.* = £60 sum he must sell it for;

therefore, $\frac{60 \times 20}{5} = 240$ the number of gallons he must have;

and therefore, 240 − 128 = 112 the number of gallons of water that must be added.

(8) 4 shillings in the pound is $\frac{1}{5}$ of a debt,
5 .... $\frac{1}{4}$ ....,
10 .... $\frac{1}{2}$ ....;

therefore, he receives for the bad debts,

	£.	*s.*	*d.*		£.	*s.*	*d.*
	360	7	6	÷ 5 =	72	1	6
	120	13	0	÷ 4 =	30	3	3
	21	4	0	÷ 2 =	10	12	0
he receives in all					112	16	9
his good debts are					456	18	3
his assets					569	15	0

£4558 ÷ £569 15*s.* gives 8 as a quotient;
therefore he pays $\frac{1}{8}$ of his debts, or 2*s.* 6*d.* in the £.

VIII.

(2)

	ton	cwt.	qr.	lbs.	oz.	drs.
315 { 9	1	3	1			
7		2	2	9	5	$5\frac{1}{3}$
5			1	13	5	$5\frac{1}{3}$
Ans.				8	4	$4\frac{4}{15}$

(3) $$\overset{s.\quad d.}{(25\,.\,6)}\times 98=\overset{s.}{\frac{51\times 98}{2}}=\overset{\text{guineas.}}{\frac{51\times 49}{21}}=\overset{\text{guineas.}}{119}\text{ value of brandy;}$$

therefore, $\overset{\text{guineas.}}{119}-39=\overset{\text{guineas.}}{80}$ value of the cloth;

therefore $\frac{80\times 21\times 12}{576}d.=\frac{80\times 21}{48}d.=35d.=2s.\ 11d.$ per yard.

(4)
$$\begin{array}{r l}
\overset{s.}{7000} & \text{per hour}\\
9 & \\ \hline
63000 & \text{per day}\\
67 & \\ \hline
441000 & \\
378000 & \\ \hline
2,0\,|\,422100,0 & \\ \hline
\pounds 211050 & \text{in 67 days.}
\end{array}$$

(5) In 1852 there were 366 days.

Now (£2 0*s.* 1½*d.*) × 366 = £734 5*s.* 9*d.*;

∴ £734 5*s.* 9*d.* + £50 = £784 5*s.* 9*d.* his income.

(6) 1.
$$\begin{array}{r c c c}
\pounds. & f. & c. & m.\\
896\ . & 5\ . & 4\ . & 7\\
391\ . & 5\ . & 3\ . & 8\\
23\ . & 0\ . & 9\ . & 6\\ \hline
\pounds 1311\ . & 1\ . & 8\ . & 1
\end{array}$$

2.
$$\begin{array}{r c c c}
\pounds. & f. & c. & m.\\
896\ . & 5\ . & 4\ . & 7\\
391\ . & 5\ . & 3\ . & 8\\ \hline
\pounds 505\ . & 0\ . & 0\ . & 9
\end{array}$$

3.
$$\begin{array}{r}
\text{mils.}\\
23096\\
248\\ \hline
184768\\
92384\ \\
46192\ \ \\ \hline
5727808
\end{array}=\overset{\pounds.}{5727}\ .\ \overset{f.}{8}\ .\ \overset{c.}{0}\ .\ \overset{m.}{8}$$

(7)
$$\begin{array}{r l r r r l}
 & & \pounds. & s. & d. & \\
(\pounds 11\ 11s.)\times & 175= & 2021\ . & 5\ . & 0 & \text{value of oxen}\\
(\pounds 1\ 11s.\ 6d.)\times & 2003= & 3154\ . & 14\ . & 6 & \text{value of sheep}\\
(10s.\ 6d.)\times & 563= & 295\ . & 11\ . & 6 & \text{value of pigs}\\
9d.\times & 87= & 3\ . & 5\ . & 3 & \text{value of fowls}\\ \hline
 & 5\,| & 5474\ . & 16\ . & 3 & \\ \hline
 & \textit{Ans.} & \pounds 1094\ . & 19\ . & 3 & \text{share of each.}
\end{array}$$

(8) $\frac{4}{5}$ of £90 = £72 sum the house is rated at. Now upon each £ I pay in the course of the year

$$(9+10+14+8+19)d.=60d.;$$

$$\therefore\ (72\times 60)d.=(6\times 60)s.=\pounds 18\text{ amount of rates;}$$

$$\therefore\ \pounds 90+\pounds 18=\pounds 108\text{ whole cost of house.}$$

IX.

(1) In the year 1851 he had lived 171 days. Now between Jan. 1, 1770, and June 1, 1851, he had lived, since 1800 was not a leap year,

$$(365\times 62+366\times 19+171)\text{ days}=29755\text{ days.}$$

$$\text{Now }(30000-29755)\text{ days}=245\text{ days,}$$

and reckoning back from Jan 1, 1770, we find that the day required was May 1, 1769.

(2) 100 miles $=(100\times 1760\times 3)$ feet $=528000$ feet;

$$\therefore\ \frac{528000}{10}=52800\text{ revolutions of fore-wheel,}$$

$$\frac{528000}{16}=33000\text{ revolutions of hind-wheel.}$$

$$\textit{Ans.}\ \overline{19800}$$

(3)

$$\begin{array}{rrrrl}
\text{tons.} & \text{cwt.} & \text{qrs.} & \text{lb.} & \\
4\ . & 0\ . & 3\ . & 1 & \text{weight of loaded truck}\\
1\ . & 10\ . & 0\ . & 0 & \text{........ truck}\\ \hline
2\ . & 10\ . & 3\ . & 1 & \text{........ packages}\\
20 & & & & \\ \hline
50 & & & & \\
4 & & & & \\ \hline
203 & & & & \\
28 & & & & \\ \hline
1625 & & & & \\
406 & & & & \\ \hline
758)\,5685 & (7\text{ lbs.} & & & \\
5306 & & & & \\ \hline
379 & & & & \\
16 & & & & \\ \hline
758)\,6064 & (8\text{ oz.} & & & \\
6064 & & & &
\end{array}$$

Ans. 7 lbs. 8 oz. each.

(4) (£15 15*s.*) × 35 = (£78 15*s.*) × 7 = £551 5*s.* worth of *A*'s ponies,

(£24 15*s.*) × 24 = £99 × 6 = £594 value of *B*'s horses;

∴ £594 − £551 5*s.* = £42 15*s.* what *A* should give *B*.

(5) $4\frac{1}{2}$ miles $=(4\frac{1}{2}\times 1760\times 3)$ feet $=23760$ feet,

$$\begin{array}{r}
1142)\,23760\,(20\\
2284\\ \hline
920
\end{array}$$

$\therefore\ 20\frac{920}{1142}=20\frac{460}{571}$ number of seconds required.

(6) Since 1+2+3+4+5+6+7+8+9+10+11+12=78,

∴ 2×78=156 strikes in 24 hours;

also (1+2+3+4)×24=10×24=240 chimes in 24 hours;

∴ (156+240)×365=396×365=144540 times in all.

(7) 16 mi.=(16×1760×3) ft.=84480 ft.,

$$(110\times2\tfrac{1}{2})\text{ ft.}=\frac{550}{2}\text{ ft.}=275\text{ ft. he walks per minute,}$$

$$\text{also }\frac{84480}{275}=\frac{16896}{55}=\frac{1536}{5}=307\tfrac{1}{5};$$

therefore, he takes 307⅕ minutes, or 5 hrs. 7 m. 12 sec. to walk the distance.

(8) The men work 55 hours in the week,

the boys .... 77 ....;

∴ (55×6)*d.*=330*d.*=wages received by each man weekly,

(330×60)*d.*=19800*d.*=wages of all the men weekly,

also (77×2×45)*d.*=6930*d.*=wages of the boys weekly;

∴ (19800+6930)*d.*=26730*d.* total of weekly wages;

$$\therefore\ \frac{26730\times52}{12}s.=(8910\times13)s.=115830s.=£5791\ 10s.\text{ annual wages.}$$

X.

(1) 146 miles=(146×1760) yards;

$$\text{therefore, expense}=£\frac{146\times1760\times3\times21}{20}=£(146\times88\times3\times21)$$

$$=£(12848\times63)=£809424.$$

(2) £52×18= £936 his personal expenses,

£936+£150=£1086 his yearly expenditure,

£2100−£1086=£1014 his annual saving,

£1014×8=£8112 his savings in 8 years.

(3) 12 lbs. 8 oz.=200 oz.,

and 8 oz. are contained 25 times in 200 oz.;

∴ (25×12)*d.*=25*s.*=£1 5*s.* is the value required.

(4) The number of yards in the packages will be

$$7 \times 7 \times 27 \times 81,$$

and dividing these into parcels of 3 yards each, we shall have

$(7 \times 7 \times 27 \times 27)$ parcels, each worth $1\frac{1}{2}$ guineas;

$$\text{therefore, value required} = \overset{\text{guineas.}}{\frac{7 \times 7 \times 27 \times 27 \times 3}{2}} = \overset{\text{guineas.}}{\frac{107163}{2}}$$

$$= £\,\frac{107163 \times 21}{2 \times 20} = £\,\frac{2250423}{2 \times 20} = £56260\ 11s.\ 6d.$$

(5)

$$\begin{aligned} &\text{mils.} && \text{mils.} \\ 625 \times 6 &= && 3750 \text{ cost of 1st ingredients,} \\ 900 \times 4 &= && 3600 \text{ cost of 2nd ingredients,} \\ 1115 \times 10 &= && 11150 \text{ cost of 3rd ingredients,} \end{aligned}$$

$$\text{number of gallons} = 2{,}0 \,\big|\, \underline{1850{,}0} \text{ cost of mixture}$$

$$925$$

∴ 9 f. 2 c. 5 m. is the price per gallon.

(6) Since each counts 100 sovereigns per minute, 5000 persons count 500000 per minute,

$$\text{also } \frac{1000000000000}{500000} = 2000000;$$

therefore, it will take them 2000000 minutes to count a billion sovereigns. Again, the number of days will be

$$\frac{2000000}{60 \times 24} = \frac{50000}{6 \times 6} = \frac{12500}{9} = 1388\tfrac{8}{9} \text{ days.}$$

Now in 3 years, from the time they commence counting, there will be

$$366 + 365 + 365 = 1096 \text{ days,}$$

so they have $293\frac{8}{9}$ days in 1855, and 293 days will just bring them to the 20th of October.

(7)

		£.	s.	d.
	Bank note	=20	0	0
	note of hand	= 6	10	0
13	farthings	= 0	0	$3\frac{1}{4}$
45	halfpence	= 0	1	$10\frac{1}{2}$
36	threepences	= 0	9	0
58	groats	= 0	19	4
96	sixpences	= 2	8	0
67	shillings	= 3	7	0
97	half-crowns	=12	2	6
126	crowns	=31	10	0
65	half-guineas	=34	2	6
77	guineas	=80	17	0
34	moidores	=45	18	0
	Ans.	£238	5	$5\frac{3}{4}$

(8)

	s.	*d.*			£.	*s.*	*d.*
5 foremen at	4	6	per day	=	1	2	6
63 workmen at	2	9	......	=	8	13	3
75 boys at	1	8	......	=	6	5	0
47 girls at	1	4½	......	=	3	4	7½
			wages of all daily	=	19	5	4½
							6
			weekly wages	=	115	12	3

and yearly wages = £115 12*s.* 3*d.* × 52 = £6011 17*s.*

XI.

(1) The first has £568 14*s.* 4*d.* + £728 18*s.* 2*d.*, or £1297 12*s.* 6*d.* more than the third, and the second has £728 18*s.* 2*d.* more than the third. Taking away these sums from the whole amount we have £4816 3*s.* 9*d.* left, and the third part of this is £1605 7*s.* 11*d.*;

	£.	*s.*	*d.*		£.	*s.*	*d.*		£.	*s.*	*d.*
∴ share of third =	1605	7	11								
share of second =	1605	7	11	+	728	18	2	=	2334	6	1
share of first =	1605	7	11	+	1297	12	6	=	2903	0	5

(2) (£152 . 10*s.*) × 52 = £7930 . 0*s.* his annual expenditure,

(7522 . 10) ÷ 15 = 501 . 10 his annual saving,

364) 8431 . 10 (23£
728
1151
1092
59
20
364) 1190 (3*s.*
1092
98
12
364) 1176 (3*d.*
1092
84

Ans. £23 3*s.* $3\frac{3}{13}$*d.*

(3)

$$\begin{array}{r}
\text{cwt. qrs. lbs. oz.} \\
3\ .\ 2\ .\ 27\ .\ 15 \\
4 \\ \hline
14 \\
28 \\ \hline
139 \\
28 \\ \hline
419 \\
16 \\ \hline
2529 \\
419 \\ \hline
6719
\end{array}
\qquad\qquad
\begin{array}{r}
\text{tons. cwt. qrs. lbs. oz.} \\
4\ .\ 13\ .\ 2\ .\ 27\ .\ 7 \\
20 \\ \hline
93 \\
4 \\ \hline
374 \\
28 \\ \hline
3019 \\
748 \\ \hline
10499 \\
16 \\ \hline
63001 \\
10499 \\ \hline
6719)\ 167991\ (25 \\
13438 \\ \hline
33611 \\
33595 \\ \hline
16
\end{array}$$

(4) £16 4*s.* × 4 = £64 16*s.* whole cost.

Also there were (6 × 27) yds. in each bale;

therefore, cost of each yard $= \frac{£16\ 4s.}{6 \times 27} = \frac{324}{162}s. = 2s.$

(5) Yearly toll from persons $= \overset{\text{halfpence.}}{5000 \times 365} = \overset{\text{halfpence.}}{1825000} = 912500d.$

yearly toll from carriages $= (1500 \times 2 \times 365)d. = (3000 \times 365)d. = 1095000d.$

therefore, annual amount $= 1095000d. + 912500d. = 2007500d.$

$$\begin{array}{r|l}
\text{and } 12 & 2007500 \\ \hline
2,0 & 16729,1 - 8 \\ \hline
\textit{Ans.} & 8364\ 11s.\ 8d.
\end{array}$$

(6) $\overset{\text{days.}}{31+28+31+30+31+30} = \overset{\text{days.}}{181}$

and

$$\begin{array}{r}
181)\ \overset{£.}{210}\ (\overset{£.}{1} \\
181 \\ \hline
29 \\
20 \\ \hline
181)\ 580\ (3s. \\
543 \\ \hline
37 \\
12 \\ \hline
181)\ 444\ (2d. \\
362 \\ \hline
82 \\
4 \\ \hline
181)\ 328\ (1q. \\
181 \\ \hline
147
\end{array}$$

Therefore *Ans.* = £1 3*s.* 2¼*d.* $\frac{147}{181}q.$

(7) 7*s.* $10\frac{1}{2}$*d.* per stone = 15*s.* 9*d.* per quarter;

therefore (15*s.* 9*d.*) × 23 = £18 2*s.* 3*d.* for the sugar.

Again, £18 2*s.* 3*d.* = 17388*q.*,

and 4*s.* $5\frac{3}{4}$*d.* = 215*q.*,

and

$$\begin{array}{r} 215)\,17388\,(80\text{ lbs.} \\ \underline{1720} \\ 188 \\ 16 \\ 215)\,\overline{3008}\,(13\text{ oz.} \\ \underline{215} \\ 858 \\ \underline{645} \\ 213 \end{array}$$

Therefore *Ans.* = 80 lbs. $13\frac{213}{215}$ oz. of tea.

(8)

$$\begin{array}{rrcrcr} & \text{£.} & & \text{s.} & & \text{d.} \\ \text{Cash} = & 500 & . & 0 & . & 0 \\ \text{5 bills (£48 10s. 6d. each)} = & 242 & . & 12 & . & 6 \\ \hline \text{the property} = & 742 & . & 12 & . & 6 \end{array}$$

$$\begin{array}{rrcrcr} & \text{£.} & & \text{s.} & & \text{d.} \\ \text{Burial cost} & 20 & . & 0 & . & 0 \\ \text{debts} & 164 & . & 0 & . & 0 \\ \hline & 184 & . & 0 & . & 0 \end{array}$$

therefore £742 12*s.* 6*d.* − £184. = £558 12*s.* 6*d.* remaining property,

£558 12*s.* 6*d.* ÷ 3 = £186 4*s.* 2*d.* for eldest son,

£558 12*s.* 6*d.* − £186 4*s.* 2*d.* = £372 8*s.* 4*d.* to be divided among the other sons;

therefore £372 8*s.* 4*d.* ÷ 4 = £93 2*s.* 1*d.* each.

XII.

(1) 2 oz. 16 dwts. = 56 dwts. 100 oz. 16 dwts. = 2016 dwts.

therefore number of spoons $= \frac{2016}{56} = \frac{252}{7} = 36.$

(2)

$$\begin{array}{rrcrl} & \text{£.} & & \text{s.} & \\ & 1227 & . & 15 & \text{yield of estate for 5 years,} \\ \text{135 guin.} = & \underline{141} & . & \underline{15} & \text{what he lays by,} \\ & \text{£}1086 & . & 0 & \text{what he may spend in 5 years.} \end{array}$$

Now 1848 was a leap year, therefore, in the 5 years there were,

$$\overset{\text{days.}}{365+366+365+365+365} = \overset{\text{days.}}{1826},$$

and $\frac{1086}{1826}£ = \frac{543}{913}£ = 11s.\ 10\frac{1}{2}d.\ \frac{870}{913}q.$ what he may spend daily.

(3) 19 years $= (19 \times 365\frac{1}{4})$ days $= \dfrac{19 \times 365\frac{1}{4}}{29\frac{1}{2}}$ lunar months

$$= \frac{19 \times 1461}{59} = \frac{27759}{59 \times 2} = 235\tfrac{29}{118}.$$

(4) 1 talent $=$ 219000 grs. $= \dfrac{219000}{24 \times 20}$ oz.;

therefore value of a talent $= \dfrac{219000 \times 5 \times 12}{24 \times 20}\,d.$

$= 27375d. = 2281s.\ 3d. = £114\ 1s.\ 3d.$

(5)

$$\begin{array}{rcrcrcl} £. & & s. & & d. & & d. \\ 14 & . & 3 & . & 6 & = & 3402 \\ 17 & . & 3 & . & 5 & = & 4121 \end{array}$$

$$\begin{array}{r} 3402)\ 4121\ (1\cdot2113 \\ \underline{3402} \\ 7190 \\ \underline{6804} \\ 3860 \\ \underline{3402} \\ 4580 \\ \underline{3402} \\ 11780 \\ \underline{11206} \\ 574 \end{array}$$

(6) $(5s.\ 3\frac{1}{2}d.) \times 56 = (£2\ 2s.\ 4d.) \times 7 = £14\ 16s.\ 4d.$,

also $£55\ 12s. + £3\ 11s. = £59\ 3s.$;

$\therefore$ $£59\ 3s. - £14\ 16s.\ 4d. = £44\ 6s.\ 8d.$,

the price for which he has to sell the remainder.

Now he had (7×27) yds. $= 189$ yds. at first;

therefore, he has $(189 - 56)$ yds. $= 133$ yds. to sell,

the price of each yard will then be

$$£44\tfrac{1}{3} \div 133 = £\frac{133}{3} \div 133 = £\tfrac{1}{3} = 6s.\ 8d.$$

(7) 18 times the number of men = number of pence the men earned,

20 times the number of men = number of pence the women earned,

24 times the number of men = number of pence the boys earned,

$\therefore$ 62 times the number of men = number of pence earned by all;

also $(£7\ 15s.) \div 5 = £1\ 11s. = (31 \times 12)d.$,

therefore, number of men $= \dfrac{31 \times 12}{62} = \dfrac{12}{2} = 6$;

therefore, number of women $= 6 \times 2 = 12$,

and number of boys $= 6 \times 3 = 18$.

(8) For every £ he pays $6s.\ 8\frac{1}{4}d. = 321q.$;

therefore, he pays in all $2963 \times 321q.$

$$\begin{array}{r|l}
 & \,2963 \\
 & \,\underline{321} \\
 & \,2963 \\
 & 5926 \\
 & 8889 \\
\hline
4 & 951123 - 3q. \\
\hline
12 & 237780 - 0d. \\
\hline
2{,}0 & 1981{,}5 \\
\end{array}$$

$$\textit{Ans.}\quad £990\ 15s.\ 0\tfrac{3}{4}d.$$

REDUCTION OF FRACTIONS.

Ex. XLVIII. (p. 140.)

(1) 1. $\frac{3}{8}$ of $£1 = \left(\frac{3 \times 20}{8}\right)s. = \frac{15}{2}s. = 7s.\ 6d.$;

$\frac{2}{3}$ of $£1 = \left(\frac{2 \times 20}{3}\right)s. = \frac{40}{3}s. = 13s.\ 4d.$;

$\frac{5}{8}$ of $£1 = \left(\frac{5 \times 20}{8}\right)s. = \frac{25}{2}s. = 12s.\ 6d.$;

$\frac{3}{4}$ of a guinea $= \left(\frac{3 \times 21}{4}\right)s. = \frac{63}{4}s. = 15s.\ 9d.$;

$\frac{5}{6}$ of a guinea $= \left(\frac{5 \times 21}{6}\right)s. = \frac{35}{2}s. = 17s.\ 6d.$

2. $\frac{3}{4}$ of $£1\ 10s. = \left(\frac{3 \times 30}{4}\right)s. = \frac{45}{2}s. = £1\ 2s.\ 6d.$;

$\frac{2}{3}$ of $£2 = \left(\frac{2 \times 40}{3}\right)s. = \frac{80}{3}s. = £1\ 6s.\ 8d.$;

$\frac{3}{8}$ of $2s.\ 6d. = \left(\frac{3 \times 30}{8}\right)d. = \frac{45}{4}d. = 11\frac{1}{4}d.$;

$\frac{3}{5}$ of $13s.\ 4d. = \left(\frac{3 \times 160}{5}\right)d. = (3 \times 32)d. = 8s.$

3. $\frac{13}{240}$ of $£1 = \left(\frac{13 \times 240}{240}\right)d. = 13d. = 1s.\ 1d.$;

$\frac{5}{16}$ of $1s. = \left(\frac{5 \times 12}{16}\right)d. = \frac{15}{4}d. = 3\frac{3}{4}d.$;

$\frac{3}{5}$ of $6s.\ 8d. = \left(\frac{3 \times 80}{5}\right)d. = (3 \times 16)d. = 4s.$;

$\frac{2}{9}$ of $1s.\ 6d. = \left(\frac{2 \times 18}{9}\right)d. = (2 \times 2)d. = 4d.$;

$\frac{3}{7}$ of $3s.\ 6d. = \left(\frac{3 \times 42}{7}\right)d. = (3 \times 6)d. = 1s.\ 6d.$

4. $2\frac{3}{7}$ of $7s.\ 6d. = \frac{17 \times 90}{7}d. = \frac{1530}{7}d. = 18s.\ 2\frac{1}{2}d.\ \frac{2}{7}q.$;

$\frac{5}{7}$ of £2 $3s.\ 9d. = \frac{£10\ 18s.\ 9d.}{7} = £1\ 11s.\ 3d.$;

$\frac{8}{21}$ of a moidore $= \left(\frac{8 \times 27}{21}\right)s. = \frac{72}{7}s. = 10s.\ 3\frac{1}{4}d.\ \frac{5}{7}q.$;

$\frac{2}{3}$ of £135 $16s.\ 10\frac{1}{2}d. = \frac{£271\ 13s.\ 9d.}{3} = £90\ 11s.\ 3d.$

5. $\frac{2}{5}$ of $4s.\ 7d. = \left(\frac{2 \times 55}{5}\right)d. = (2 \times 11)d. = 1s.\ 10d.$;

$1\frac{3}{5}$ of £1 $2s.\ 9d. = \frac{8}{5}$ of £1 $2s.\ 9d. = \frac{£9\ 2s.}{5} = £1\ 16s.\ 4\frac{3}{4}d.\ \frac{1}{5}q.$;

$\frac{5}{14}$ of $\frac{11}{18}$ of $21s. = \left(\frac{5 \times 11 \times 21}{14 \times 18}\right)s. = \frac{55}{12}s. = 4s.\ 7d.$

$\frac{1}{3}$ of $\frac{3}{5}$ of $9s.\ 10\frac{1}{2}d. = \frac{1}{5}$ of $9s.\ 10\frac{1}{2}d. = 1s.\ 11\frac{1}{2}d.\ \frac{4}{5}q.$

6. $3\frac{1}{12}$ of $2s.\ 6d. = 7s.\ 6d. + \frac{30}{12}d. = 7s.\ 6d. + 2\frac{1}{2}d. = 7s.\ 8\frac{1}{2}d.$;

$\frac{9}{11}$ of £4 $14s.\ 5d. = \frac{£42\ 9s.\ 9d.}{11} = £3\ 17s.\ 3d.$

$\frac{2}{3}$ of $\frac{4}{21}$ of $10s.\ 6d. = \left(\frac{2 \times 4 \times 21}{3 \times 21}\right)$ sixpences $= \left(\frac{2 \times 4 \times 6}{3}\right)d. = 1s.\ 4d.$;

$\frac{1}{50}$ of 100 guineas = 2 guineas = £2 2*s*.

7. $\frac{3}{5}$ of $\frac{7}{9}$ of $\frac{20}{21}$ of 5 guineas $= \frac{3 \times 7 \times 20 \times 5 \times 21}{5 \times 9 \times 21}s. = \frac{140}{3}s. = £2\ 6s.\ 8d.$

$\frac{2}{9}$ of £16 $16s.\ 3\frac{1}{4} = \frac{£33\ 12s.\ 6\frac{1}{2}d.}{9} = £3\ 14s.\ 8\frac{1}{2}d.\ \frac{2}{3}q.$

$\frac{1}{1000}$ of £441 $12s.\ 6d. = \frac{£44\ 3s.\ 3d.}{100} = \frac{£4\ 8s.\ 3\frac{3}{4}d.\ \frac{2}{5}q.}{10} = 8s.\ 9\frac{3}{4}d.\ \frac{24}{25}q.$

8. $\frac{5}{16}$ of a cwt. $= \frac{5\times112}{16}$ lbs. $=(5\times7)$ lbs. $=35$ lbs. $=1$ qr. 7 lbs.;

$\frac{3}{4}$ of a lb. Avoird. $=\frac{3\times16}{4}$ oz. $=12$ oz.;

$\frac{4}{5}$ of a mile $=\frac{4\times8}{5}$ fur. $=6\frac{2}{5}$ fur. $=6$ fur. 88 yds.;

$\frac{5}{8}$ of an acre $=\frac{5\times4}{8}$ ro. $=\frac{5}{2}$ ro. $=2$ ro. 20 po.

9. $\frac{5}{11}$ of a mile $=\frac{5\times1760}{11}$ yds. $=800$ yds. $=3$ fur. 25 po. $2\frac{1}{2}$ yds ;

$\frac{3}{10}$ of a day $=\frac{3\times24}{10}$ hrs. $=7\frac{1}{5}$ hrs. $=7$ hrs. 12 m.;

$\frac{2}{3}$ of a yard $=\frac{2\times3}{3}$ ft. $=2$ ft.;

$\frac{2}{7}$ of 3 cwt. 1 qr. 14 lbs. $=\frac{6\text{ cwt. }3\text{ qrs.}}{7}=3$ qrs. 24 lbs.

10. $7\frac{3}{5}$ lbs. Avoird. $=7$ lbs. $+\left(\frac{3\times16}{5}\right)$ oz. $=7$ lbs. $9\frac{3}{5}$ oz.
$=7$ lbs. 9 oz. $9\frac{3}{5}$ drs.;

$1\frac{3}{4}$ lb. Troy $=1$ lb. $+\left(\frac{3\times12}{4}\right)$ oz. $=1$ lb. 9 oz.;

$2\frac{2}{5}$ of a gallon $=2$ gall. $+\frac{2\times8}{5}$ pts. $=2$ gall. $3\frac{1}{5}$ pts.
$=2$ gall. 1 qt. $1\frac{1}{5}$ pt.;

$4\frac{5}{19}$ of an acre $=4$ ac. $+\frac{20}{19}$ ro. $=4$ ac. 1 ro. 2 po. 3 yds. 1 ft. $94\frac{14}{19}$ in.

11. $3\frac{5}{12}$ of a hhd. of beer $=3$ hhd. $+\frac{5\times54}{12}$ gall.
$=3$ hhd. $+\frac{45}{2}$ gall. $=3$ hhd. 22 gall. 2 qts.;

$2\frac{3}{8}$ of a tun of wine $=2$ tuns $+\frac{6}{8}$ pipe $=2$ tun $1\frac{1}{2}$ hhd.
$=2$ tuns 1 hhd. 31 gall. 2 qts.;

$6\frac{26}{29}$ bus. $=6$ bus. $+\frac{26\times4}{29}$ pks.
$=6$ bus. $\frac{104}{29}$ pks. $=6$ bus. 3 pks. $1\frac{5}{29}$ gall.

12. $2\frac{1}{6}$ of a load $=2$ ld. $+1$ c. $2\frac{2}{3}$ bus. $=2$ ld. 1 c. 2 bus. 2 pks. $10\frac{2}{3}$ pts.;

$3\frac{109}{570}$ cub. yd. $=3$ c. yd. $+\dfrac{109\times27}{570}$ ft. $=3$ c. yd. $+\left(\dfrac{981}{190}\right)$ft.

$=3$ yds. 5 ft. $281\frac{89}{95}$ in.;

$9\frac{5}{12}$ guineas $=$ £9 9*s.* $+(\frac{5}{12}\times21\times12)d.=$ £9 9*s.* $+105d.=$ £9 17*s.* 9*d.*

13. $\frac{7}{8}$ of $\frac{3}{5}$ of $10\frac{2}{3}$ hrs. $=\left(\dfrac{7\times3\times32}{8\times5\times3}\right)$hrs. $=\dfrac{28}{5}$ hrs. $=5$ hrs. 36 min.;

£ $\dfrac{15\frac{3}{5}}{7\frac{4}{5}}=$ £ $\dfrac{\frac{78}{5}}{\frac{39}{5}}=$ £$\frac{78}{39}=$ £2;

$\dfrac{7\frac{1}{8}}{8\frac{1}{7}}$ of $\dfrac{5\frac{1}{7}}{7\frac{1}{5}}$ of 27*s.* $=\left(\dfrac{57}{8}\times\dfrac{7}{57}\times\dfrac{36}{7}\times\dfrac{5}{36}\times27\right)s.$

$=\left(\dfrac{5\times27}{8}\right)s.=16s.\ 10\frac{1}{2}d.$

14. $\dfrac{\frac{4}{49}}{\frac{5}{14}\text{ of }1\frac{1}{3}}$ of £16 8*s.* $1\frac{1}{2}d.=\dfrac{4}{49}\times\dfrac{14}{5}\times\dfrac{3}{4}$ of £16 8*s.* $1\frac{1}{2}d.$

$=\dfrac{2\times3}{7\times5}$ of £16 8*s.* $1\frac{1}{2}d.=\dfrac{\text{£}98\ 8s.\ 9d.}{7\times5}=\dfrac{\text{£}14\ 1s.\ 3d.}{5}=$ £2 16*s.* 3*d.*;

$\frac{3}{7}$ of $1\frac{2}{5}$ of $12\frac{1}{2}$ of $\frac{3}{44}$ of £2 $\times\frac{3}{44}=$ £ $\dfrac{3\times7\times25\times3\times2\times3}{7\times5\times2\times44\times44}=$ £ $\dfrac{27\times5}{44\times44}$

$=\dfrac{27\times5\times20\times12}{44\times44}d.=\dfrac{27\times5\times5\times3}{11\times11}d.$

$=\dfrac{2025}{11\times11}d.=\dfrac{184\,.\,\frac{1}{11}d.}{11}=1s.\ 4\frac{1}{2}d.\ \frac{114}{121}q.$

15. $\frac{5}{7}$ of £1 $\times5\frac{3}{5}=$ £ $\dfrac{5\times28}{7\times5}=$ £4;

$\frac{3}{8}$ of $\frac{2}{9}$ of £1 $\div\frac{1}{4}=$ £ $\dfrac{3\times2\times4}{8\times9}=$ £$\frac{1}{3}=6s.\ 8d.$

16. $19\frac{3}{4}$ of £5 1*s.* $1\frac{1}{4}d.\ \frac{45}{79}q.=\frac{79}{4}$ of $4853\frac{45}{79}$ farthings

$=\frac{79}{4}$ of $\frac{383432}{79}$ farthings $=95858q.=$ £99 17*s.* $0\frac{1}{2}d.$;

$2\frac{3}{5}$ of £8 14*s.* $2\frac{7}{12}d.\div8\frac{4}{5}=\frac{13}{5}$ of £8 14*s.* $2\frac{7}{12}d.\times\frac{5}{44}$

$=\dfrac{\text{£}104\ 10s.\ 7d.}{44}=\dfrac{\text{£}9\ 10s.\ 0\frac{7}{11}d.}{4}=$ £2 7*s.* $6\frac{7}{44}d.$

(2) 1. $\frac{3}{5}$ of £1 $=12s.$; $\frac{2}{7}$ of $21s.=6s.$;

therefore, value required $=12s.+6s.+3s.\ 2d.=$ £1 1*s.* 2*d.*

2.
s. d.
$\frac{3}{8}$ of £1 = 7 . 6
$\frac{3}{8}$ of 2*s*. 6*d*. = 0 . $11\frac{1}{4}$
$\frac{3}{8}$ of 1*s*. = 0 . $4\frac{1}{2}$
value required = 8 . $9\frac{3}{4}$

3.
s. d.
$\frac{1}{7}$ of £1 = 2 . $10\frac{2}{7}$
$\frac{2}{9}$ of 1*s*. = 0 . $2\frac{2}{3}$
$\frac{5}{12}$ of 1*d*. = 0 . $0\frac{5}{12}$
Ans. required = 3 . $1\frac{31}{84}$

4. $\frac{5}{28}$ of $\frac{11}{18}$ of 10*s*. 6*d*. $= \dfrac{5\times11\times21\times6}{28\times18}d. = \dfrac{55}{4}d.$ = 1*s*. $1\frac{3}{4}$*d*.;

$\frac{5}{8}$ of 1*s*. = $7\frac{1}{2}$*d*. and $\frac{1}{12}$ of 2*s*. 6*d*. = $2\frac{1}{2}$*d*.;

therefore, value required = 1*s*. $1\frac{3}{4}$*d*. + $7\frac{1}{2}$*d*. + $2\frac{1}{2}$*d* = 1*s*. $11\frac{3}{4}$*d*.

5. $\frac{5}{8}$ of £1 = $\frac{100}{8}$*s*. = 12*s*. 6*d*.; $\frac{5}{8}$ of 1*s*. = $\frac{60}{8}$*d*. = $7\frac{1}{2}$*d*.;

$\frac{5}{8}$ of 21*s*. = $\frac{105}{8}$*s*. = 13*s*. $1\frac{1}{2}$*d*.; $\frac{5}{8}$ of 27*s*. = $\frac{135}{8}$*s*. = 16*s*. $10\frac{1}{2}$*d*.;

therefore, value = 12*s*. 6*d*. + 13*s*. $1\frac{1}{2}$*d*. − $7\frac{1}{2}$*d*. − 16*s*. $10\frac{1}{2}$*d*.
= 25*s*. $7\frac{1}{2}$*d*. − 17*s*. 6*d*. = 8*s*. $1\frac{1}{2}$*d*.

6.
£. s. d.
£$3\frac{5}{8}$ = 3 . 12 . 6
$7\frac{4}{8}$*s*. = 0 . 7 . 6
$4\frac{3}{4}$*d*. = 0 . 0 . $4\frac{3}{4}$
value required £4 . 0 . $4\frac{3}{4}$

7.
s. d.
$\frac{2}{3}$ of £1 = 13 . 4
$\frac{2}{9}$ of 1*s*. = 0 . $2\frac{2}{3}$
13 . $6\frac{2}{3}$
$\frac{5}{6}$ of 2*s*. 6*d*. = 2 . 1
value = 11 . $5\frac{2}{3}$ = 11*s*. $5\frac{1}{2}$*d*. $\frac{2}{3}$*q*.

8.
£. s. d.
$\frac{2}{3}$ of 10*s*. 6*d*. = 0 . 7 . 0
$\frac{7}{8}$ of 27*s*. = $\frac{189}{8}$*s*. = 1 . 3 . $7\frac{1}{2}$
1 . 10 . $7\frac{1}{2}$
$\frac{6}{11}$ of 6*s*. 8*d*. = $\frac{480}{11}$*d*. = 0 . 3 . $7\frac{1}{2}$ $\frac{6}{11}$
value required = 1 . 6 . $11\frac{3}{4}$ $\frac{5}{11}$

9.
£. s. d.
$\frac{7}{64}$ of 32*s*. = 0 . 3 . 6
$\frac{2}{15}$ of £3 5*s*. = 0 . 8 . 8
$\frac{7}{11}$ of $\frac{3}{2}$ of 21*s*. = 1 . 0 . $0\frac{1}{2}$ $\frac{2}{11}$
value required = 1 . 12 . $2\frac{1}{2}$ $\frac{2}{11}$

10.
s. d.
$\frac{3}{4}$ of $\frac{5}{8}$ of £1 = $\frac{75}{8}$*s*. = 9 . $4\frac{1}{2}$
$\frac{2}{3}$ of $\frac{5}{9}$ of 30*d*. = $\frac{100}{9}$*d*. = 0 . 11 $\frac{4}{9}$
$\frac{3}{4}$ of $10\frac{1}{2}$*d*. = $\frac{63}{8}$*d*. = 0 . $7\frac{3}{4}$ $\frac{1}{2}$
value required = 10 . $11\frac{1}{4}$ $\frac{17}{18}$

11.
s. d.
$\frac{2}{9}$ of 21*s*. = $\frac{14}{3}$*s*. = 4 . 8
$\frac{1}{2}$ of $\frac{3}{4}$ of 20*s*. = 7 . 6
$\frac{1}{3}$ of $\frac{5}{8}$ of 12*d*. = 0 . $2\frac{1}{2}$
12 . $4\frac{1}{2}$
$\frac{1}{6}$ of $\frac{3}{4}$ of 60*d*. = 0 . $7\frac{1}{2}$
value required = 11 . 9

12.
£. s. d.
$\frac{3}{7}$ of £15 = £$\frac{45}{7}$ = 6 . 8 . $6\frac{3}{4}$ $\frac{3}{7}$
$\frac{5}{8}$ of $\frac{5}{14}$ of 32*s*. = $\frac{50}{7}$*s*. = 0 . 7 . $1\frac{1}{2}$ $\frac{6}{7}$
$\frac{4}{7}$ of 3*d*. = $\frac{12}{7}$*d*. = 0 . 0 . $1\frac{1}{2}$ $\frac{6}{7}$
value required = 6 . 15 . $10\frac{1}{4}$ $\frac{1}{7}$*q*.

13. $$\frac{2}{3\frac{1}{2}} \text{ of } \frac{4}{\frac{5}{7}-\frac{1}{9}} \text{ of 2 guineas} = \frac{4}{7} \text{ of } \frac{4 \times 63}{45-7} \text{ of } 42s.$$

$$= \frac{4 \times 4 \times 63 \times 42}{7 \times 38} s. = \frac{3024}{19} s. = £7\ 19s.\ 1\tfrac{17}{19}.$$

$$\frac{1\frac{7}{8}+\frac{3}{4}}{3\frac{4}{5}-\frac{2}{3}} \text{ of } £5 = \frac{1\frac{13}{8}}{3\frac{2}{15}} \text{ of } £5 = \frac{21}{8} \times \frac{15}{47} \text{ of } 100s.$$

$$= \frac{21 \times 15 \times 25}{2 \times 47} s. = \frac{7875}{94} s. = £4\ 3s.\ 9\tfrac{15}{47}d.;$$

$\therefore$ value $= £7\ 19s.\ 1\tfrac{17}{19}d. + £4\ 3s.\ 9\tfrac{15}{47} = £12\ 2s.\ 11\tfrac{101}{893}d.$

14. $$\frac{3}{5} \text{ ton} = \left(\frac{3 \times 20}{5}\right) \text{ cwt.} = 12 \text{ cwt.}$$

$$\frac{5}{8} \text{cwt.} = \left(\frac{5 \times 112}{8}\right) \text{lbs.} = (5 \times 14) \text{ lbs.} = 2 \text{ qrs. } 14 \text{ lbs.}$$

$$\frac{2}{3} \text{ lb.} = \left(\frac{2 \times 16}{3}\right) \text{ oz.} = 10 \text{ oz. } 10\tfrac{2}{3} \text{ drs.};$$

$\therefore$ value = 12 cwt. 2 qrs. 14 lbs. 10 oz. $10\frac{2}{3}$ drs.

15. $$\frac{3}{8} \text{lb. troy} = \left(\frac{3 \times 12}{8}\right) \text{ oz.} = 4 \text{ oz. } 10 \text{ dwts.}$$

$$\frac{5}{6} \text{lb. troy} = \left(\frac{5 \times 12}{6}\right) \text{ oz.} = 10 \text{ oz.}$$

14 oz. 10 dwts.

$$\frac{8}{9} \text{oz. troy} = \left(\frac{8 \times 20}{9}\right) \text{ dwts.} = 17 \text{ dwts. } 18\tfrac{2}{3} \text{ grs.}$$

Value = 1 lb. 1 oz. 12 dwts. $5\frac{1}{3}$ grs.

16. $$\begin{array}{lrrrr} & & \text{fur.} & \text{po.} & \text{yds.} \\ \frac{7}{10} \text{ mile} = \left(\frac{7 \times 8}{10}\right) \text{ fur.} & = & 5\ . & 24 & \\ \frac{5}{8} \text{ fur.} = \left(\frac{5 \times 40}{8}\right) \text{ po.} & = & & 25 & \\ \hline & \text{fur.} & 4\ . & 39 & \\ \frac{4}{11} \text{ po.} = \left(\frac{4 \times 5\frac{1}{2}}{11}\right) \text{ yds.} & = & & & 2 \\ \hline & \text{Value} = & 4\ . & 39\ . & 2 \end{array}$$

17. $$\frac{9}{111}\text{ cub. yds.} = \left(\frac{9\times 27}{111}\right)\text{ c. ft.} \begin{array}{rcl} \text{c. ft.} & & \text{c. in.} \\ = 2 & . & 326\frac{34}{37} \end{array}$$

$$2\tfrac{7}{8}\text{ cub. ft.} = 2\text{ c. ft.} + \frac{7\times 1728}{8}\text{ in.} = 2 \;.\; 1512$$

$$\text{Value} = 5 \;.\; 110\tfrac{34}{37}$$

18. $$\frac{2}{3}\text{ of a qr.} = \frac{2\times 8}{3}\text{ bus.} \begin{array}{rcl} \text{bus.} & & \text{pk.} \\ = 5 & . & 1\frac{1}{3} \end{array}$$

$$\frac{3}{4}\text{ bus.} = \frac{3\times 4}{4}\text{ pk.} = \; 3$$

$$6 \;.\; 0\tfrac{1}{3}$$

$$\frac{1}{6}\text{ qr.} = \frac{1\times 8}{6}\text{ bus.} = 1 \;.\; 1\tfrac{1}{3}$$

$$\text{Value} = 4 \;.\; 3$$

19. $$\frac{3}{5}\text{ of 7 fur. 29po. 3yds. 9in.} = \frac{\text{23fur. 7po. 9yd. 2ft. 3in.}}{5}$$

$$= \text{4 fur. 25po. 4yds. 0ft. } 5\tfrac{2}{5}\text{ in.}$$

$$\frac{5}{7}\text{ of 5m. 3f. 37 po. } 4\tfrac{1}{5} = \frac{\text{27 m. 3 fur. 37 po. } 4\frac{1}{2}\text{ yds.}}{7} \begin{array}{ccccccccc} \text{m.} & & \text{fur.} & & \text{po.} & & \text{yds.} & & \text{in.} \\ = 3 & . & 7 & . & 15 & . & 3 & . & 0 \end{array}$$

$$4 \;.\; 25 \;.\; 4 \;.\; 5\tfrac{2}{5}$$

$$\text{Value} = 4 \;.\; 4 \;.\; 1 \;.\; 1\tfrac{1}{2} \;.\; 5\tfrac{2}{5}$$

20. $$7\tfrac{2}{5}\text{ of } 365\tfrac{1}{4}\text{ days} = \frac{37}{5}\text{ of }\frac{1461}{4}\text{ days} = \frac{54057}{20}\text{ days} = \text{2702 days 20 hrs. 24 m.}$$

$$3\tfrac{9}{10}\text{ of }\frac{5}{6}\text{ wks.} = \frac{39\times 5\times 7}{10\times 6}\text{ days} = \frac{13\times 7}{2\times 2}\text{ days} = \frac{91}{4}\text{ days} = \text{22 days 18 hrs.}$$

$$\frac{3}{4}\text{ of } 5\tfrac{5}{9}\text{ hrs.} = \frac{3\times 50}{4\times 9}\text{ hrs.} = \text{4 hrs. 10 m.}$$

$\therefore$ value required = 2725 days 18 hrs. 34 m.

21. $$\frac{1}{11}\text{ of 91 ac. 3 ro. 36 po. } 2\tfrac{3}{4}\text{ yds.} \begin{array}{ccccccc} \text{ac.} & & \text{ro.} & & \text{po.} & & \text{yds.} \\ = 8 & . & 1 & . & 17 & . & 25 \end{array}$$

$$\frac{3}{5}\text{ of 6 ac. 2 ro. 17 po. } 25\tfrac{1}{3}\text{ yds.}$$

$$= \frac{\text{19 ac. 3ro. 13po. } 15\frac{1}{2}\text{ yds.}}{5} = 3 \;.\; 3 \;.\; 34 \;.\; 21\tfrac{1}{4}$$

$$\text{Value required} = 4 \;.\; 1 \;.\; 23 \;.\; 3\tfrac{3}{4}$$

Ex. XLIX. (p. 142.)

(1) 1. 6*s.* 8*d.* = 80*d.*, and £1 = 240*d.*;

$$\therefore \text{ fraction } = \frac{80}{240} = \frac{1}{3}.$$

3*s.* $1\frac{1}{2}$*d.* = 75 halfpence, and 1 guinea = (21 × 12 × 2) halfpence;

$$\therefore \text{ fraction} = \frac{75}{21 \times 12 \times 2} = \frac{25}{168}.$$

2. 5*d.* = 5*d.*, and 1*s.* = 12*d.*;

$$\therefore \text{ fraction } = \frac{5}{12}.$$

3*s.* $4\frac{1}{2}$*d.* = 81 halfpence, and £1 = (20 × 12 × 2) halfpence;

$$\therefore \text{ fraction} = \frac{81}{20 \times 12 \times 2} = \frac{27}{160}.$$

3. $7\frac{1}{2}$*d.* = 15 halfpence, and 27*s.* = (27 × 12 × 2) halfpence;

$$\therefore \text{ fraction } = \frac{15}{27 \times 12 \times 2} = \frac{5}{216}.$$

15 sixpences = 90*d.*, and 13*s.* 4*d.* =160*d.*;

$$\therefore \text{ fraction} = \frac{90}{160} = \frac{9}{16}.$$

4. £1 3*s.* 4*d.* = 280*d.*, and £9 6*s.* 8*d.* = 2240*d.*;

$$\therefore \text{ fraction} = \frac{280}{2240} = \frac{7}{56} = \frac{1}{8}.$$

2*s.* $0\frac{1}{4}$*d.* = 97*q.*, and 10*s.* 6*d.* = 504*q.*;

$$\therefore \text{ fraction} = \frac{97}{504}.$$

5. £4 17*s.* 6*d.* = 195 sixpences, and £5 = (5 × 20 × 2) sixpences;

$$\therefore \text{ fraction} = \frac{195}{5 \times 20 \times 2} = \frac{39}{40}.$$

16*s.* = 16*s.*, and £200 = (200 × 20)*s.*;

$$\therefore \text{ fraction} = \frac{16}{200 \times 20} = \frac{1}{50 \times 5} = \frac{1}{250}.$$

6. £18 7*s.* 6*d.* = 735 sixpences; and £2 = (2 × 20 × 2) sixpences;

$$\therefore \text{ fraction} = \frac{735}{2 \times 20 \times 2} = \frac{147}{16}.$$

$$6s.\ 7\tfrac{6}{7}d. = 79\tfrac{6}{7}d. = \frac{559}{7}\,d.\text{, and } 7s.\ 9d. = 93d.;$$

$$\therefore \text{ fraction} = \frac{559}{7 \times 93} = \frac{559}{651}.$$

7. $$1s.\ 2d. = 14d.\text{, and a moidore} = (27 \times 12)d.;$$

$$\therefore \text{ fraction} = \frac{14}{27 \times 12} = \frac{7}{162}.$$

$$3s.\ 4d. = 40d.\text{, and } 10s.\ 6d. = 126d.;$$

$$\therefore \text{ fraction} = \frac{40}{126} = \frac{20}{63}.$$

8. $$3\text{ qrs. } 19\text{ lbs.} = 103\text{ lbs., and a ton} = (20 \times 112)\text{ lbs.};$$

$$\therefore \text{ fraction} = \frac{103}{20 \times 112} = \frac{103}{2240}.$$

$$61\tfrac{7}{8}\text{lbs.} = \left(\frac{495}{8} \times 16\right)\text{oz.} = 990\text{ oz.};$$

$$\therefore \text{ fraction} = \frac{990}{4} = \frac{495}{2}.$$

9. $$3\text{ qrs. } 4\text{ lbs.} = 88\text{ lbs., and } 2\text{ cwt.} = (2 \times 112)\text{ lbs.};$$

$$\therefore \text{ fraction} = \frac{88}{2 \times 112} = \frac{44}{112} = \frac{11}{28}.$$

$$5\text{ oz. } 2\tfrac{2}{3}\text{ drs.} = 42\tfrac{2}{3}\text{ drs.} = \left(\frac{128}{3} \times 3 \times 20\right)\text{ grs.} = 2560\text{ grs.};$$

$$\therefore \text{ fraction} = \frac{2560}{1}.$$

10. $$3\text{ ro. } 27\tfrac{1}{2}\text{ po.} = 147\tfrac{1}{2}\text{ po.} = \frac{295}{2}\text{ po., and } 1\text{ ac.} = (1 \times 4 \times 40)\text{ po.};$$

$$\therefore \text{ fraction} = \frac{295}{2 \times 4 \times 40} = \frac{59}{2 \times 4 \times 8} = \frac{59}{64}.$$

$$26\tfrac{2}{5}\text{ sq. yds.} = \frac{132}{5}\text{ sq. yds., and } 2\text{ ac.} = (2 \times 4840)\text{ sq. yds.};$$

$$\therefore \text{ fraction} = \frac{132}{5 \times 2 \times 4840} = \frac{12}{10 \times 440} = \frac{3}{1100}.$$

11. $$126\text{ yds. } 2\text{ ft. } 6\text{ in.} = 4566\text{ in., and } 1\text{ mile} = (1760 \times 3 \times 12)\text{ in.};$$

$$\therefore \text{ fraction} = \frac{4566}{1760 \times 3 \times 12} = \frac{761}{1760 \times 6} = \frac{761}{10560}.$$

$$6\text{ c. ft. } 100\text{ c. in.} = 10468\text{ c. in., and } 1\text{ c. yd.} = (27 \times 1728)\text{ c. in.};$$

$$\therefore \text{ fraction} = \frac{10468}{27 \times 1728} = \frac{2617}{27 \times 432} = \frac{2617}{11664}.$$

12. 2 qrs. $2\frac{2}{3}$ na. = $10\frac{2}{3}$ na. = $\frac{32}{3}$ na.; and 1 Eng. ell = (5×4) na.;

$$\therefore \text{ fraction} = \frac{32}{3 \times 5 \times 4} = \frac{8}{15}.$$

8 h. 3 m. = 483 m., and 1 day = (24×60) m.;

$$\therefore \text{ fraction} = \frac{483}{24 \times 60} = \frac{161}{480}.$$

13. 1 st. 8 lbs. = 22 lbs., and 1 ton = (20×112) lbs.;

$$\therefore \text{ fraction} = \frac{22}{20 \times 112} = \frac{11}{1120}.$$

1 sc. 13 grs. = 33 grs., and 1 lb. = $(12 \times 8 \times 3 \times 20)$ grs.;

$$\therefore \text{ fraction} = \frac{33}{12 \times 8 \times 20} = \frac{11}{1920}.$$

14. 2 ac. 1 ro. = 9 ro., and 9 ac. 2 ro. = 38 ro.;

$$\therefore \text{ fraction} = \frac{9}{38}.$$

1540 yds. 2 ft. 9 in. = 55473 in., and 2 miles = $(2 \times 1760 \times 3 \times 12)$ in.;

$$\therefore \text{ fraction} = \frac{55473}{2 \times 1760 \times 3 \times 12} = \frac{18491}{24 \times 1760} = \frac{1681}{24 \times 160} = \frac{1681}{3840}.$$

15. 1 ft. $\frac{7}{8}$ in. = $144\frac{7}{8}$ sq. in. = $\frac{1159}{8}$ sq. in., and 1 sq. yd. = (9×144) sq. in.;

$$\therefore \text{ fraction} = \frac{1159}{9 \times 144 \times 8} = \frac{1159}{10368}.$$

2 qts. $1\frac{1}{2}$ pt. = $5\frac{1}{2}$ pts. = $\frac{11}{2}$ pts., and 1 bar. = (36×8) pts.;

$$\therefore \text{ fraction} = \frac{11}{2 \times 36 \times 8} = \frac{11}{576}.$$

16. 2 wks. 5 d. 7 h. 27 m. = 27807 m., and 1 day = (24×60) m.;

$$\therefore \text{ fraction} = \frac{27807}{24 \times 60} = \frac{9269}{480}.$$

1 ro. 20 po. = 60 po., and 1 ac. = (4×40) po.;

$$\therefore \text{ fraction} = \frac{60}{4 \times 40} = \frac{6}{16} = \frac{3}{8}.$$

17. 4 bus. $2\frac{2}{9}$ qt. = $130\frac{2}{9}$ qt. = $\frac{1172}{9}$ qt., and 1 ld. = $(5 \times 8 \times 4 \times 8)$ qts.;

$$\therefore \text{ fraction} = \frac{1172}{9 \times 5 \times 8 \times 4 \times 8} = \frac{293}{9 \times 40 \times 8} = \frac{293}{2880}.$$

3 quires 7 sh. = 79 sheets, and 1 ream = (20 × 24) sheets;

$$\therefore \text{ fraction} = \frac{79}{20 \times 24} = \frac{79}{480}.$$

18 $$2\tfrac{1}{2} \text{ guineas} = \frac{5 \times 21}{2}\,s., \text{ and } £2\tfrac{1}{2} = \frac{5 \times 20}{2}\,s.;$$

$$\therefore \text{ fraction} = \frac{\frac{5}{2} \times 21}{\frac{5}{2} \times 20} = \frac{21}{20}.$$

$$2\tfrac{1}{2} \text{ cwt.} = \frac{5 \times 112}{2} \text{ lbs., and } 2 \text{ tons } 12 \text{ lbs.} = 4492 \text{ lbs.};$$

$$\therefore \text{ fraction} = \frac{5 \times 56}{4492} = \frac{5 \times 14}{1123} = \frac{70}{1123}.$$

19. $$10\tfrac{5}{6} \text{ mo.} = \frac{65}{6} \text{ mo.}; \qquad \therefore \text{ fraction} = \frac{65}{6 \times 13} = \frac{5}{6}.$$

$$100\tfrac{1}{2} \text{ guineas} = \frac{201}{2} \text{ gui.} = \frac{201 \times 21 \times 3}{2} \text{ groats};$$

$$\therefore \text{ fraction} = \frac{201 \times 21 \times 3}{2} = \frac{12663}{2}.$$

20. $$6 \text{ ft. } 3\tfrac{5}{8} \text{ in.} = 75\tfrac{5}{8} \text{ in., and } 13 \text{ ft. } 8\tfrac{9}{10} \text{ in.} = 164\tfrac{9}{10} \text{ in.};$$

$$\therefore \text{ fraction} = \frac{75\frac{5}{8}}{164\frac{9}{10}} = \frac{605 \times 10}{1649 \times 8} = \frac{605 \times 5}{1649 \times 4} = \frac{3025}{6596}.$$

$$1\tfrac{1}{2} \text{ yds.} = \frac{3 \times 3 \times 12}{2} \text{ in., and } 1\tfrac{1}{2} \text{ in.} = \tfrac{3}{2} \text{ in.};$$

$$\therefore \text{ fraction} = \frac{3 \times 3 \times 12 \times 2}{2 \times 3} = \frac{36}{1}.$$

(2) 1. $$\frac{3}{4} \text{ of } 5s. = \frac{3 \times 5}{4}\,s., \text{ and } £1 = 20s.;$$

$$\therefore \text{ fraction} = \frac{3 \times 5}{4 \times 20} = \frac{3}{16}.$$

$$\frac{4}{5} \text{ of a farthing} = \frac{4}{5}\,q., \text{ and } 1s. = 48\,q.;$$

$$\therefore \text{ fraction} = \frac{4}{5 \times 48} = \frac{1}{60}.$$

2. $$\frac{5}{7} \text{ of } 1s. = \frac{5}{7}\,s., \text{ and a guinea} = 21s.;$$

$$\therefore \text{ fraction} = \frac{5}{7 \times 21} = \frac{5}{147}.$$

$\frac{1}{8}$ of 7*s.* = $\frac{7}{8}$*s.*, and a crown = 5*s.*;

$$\therefore \text{ fraction} = \frac{7}{8 \times 5} = \frac{7}{40}.$$

3. $\frac{3}{5}$ of a guinea = $\frac{3 \times 21}{5}$ *s.*, and £1 = 20*s.*;

$$\therefore \text{ fraction} = \frac{3 \times 21}{5 \times 20} = \frac{63}{100}.$$

$\frac{7}{9}$ of 27*s.* = $\frac{7 \times 27 \times 2}{9}$ sixpences, and 2*s.* 6*d.* = 5 sixpences;

$$\therefore \text{ fraction} = \frac{7 \times 27 \times 2}{9 \times 5} = \frac{42}{5}.$$

4. $\frac{4}{5}$ of 10*s.* 6*d.* = $\frac{4 \times 21}{5}$ sixpences, and £1 = 40 sixpences;

$$\therefore \text{ fraction} = \frac{4 \times 21}{5 \times 40} = \frac{21}{50}.$$

$\frac{25}{12}$ of 1*s.* = $\frac{25 \times 2}{12}$ sixpences, and 2*s.* 6*d.* = 5 sixpences;

$$\therefore \text{ fraction} = \frac{25 \times 2}{12 \times 5} = \frac{5}{6}.$$

5. $\frac{1}{8}$ of £74 13*s.* 4*d.* = £9 6*s.* 8*d.* = £9$\frac{1}{3}$ = £$\frac{28}{3}$.

$$\therefore \text{ fraction} = \frac{28}{3 \times 28} = \frac{1}{3}.$$

$\frac{1}{9}$ of 27*s.* = 3*s.* = 6 sixpences, and 3$\frac{1}{2}$ guineas = 147 sixpences;

$$\therefore \text{ fraction} = \frac{6}{147} = \frac{2}{49}.$$

6. $\frac{3}{5}$ of a dwt. = $\frac{3}{5}$dwt., and 1 lb. = (12 × 20) dwts;

$$\therefore \text{ fraction} = \frac{3}{5 \times 12 \times 20} = \frac{1}{400}.$$

$\frac{5}{6}$ of 2 lbs. = $\frac{5}{3}$lb., and 2$\frac{1}{2}$ tons = (50 × 112) lbs.

$$\therefore \text{ fraction} = \frac{5}{3 \times 50 \times 112} = \frac{1}{3360}.$$

7. $\frac{3}{8}$ of a lb. = $\frac{3}{8}$lb., and 1 cwt. = 112 lbs;

$$\therefore \text{ fraction} = \frac{3}{8 \times 112} = \frac{3}{896}.$$

$\frac{5}{6}$ of a yard $= \frac{5}{6}$ yd., and 1 mile $= 1760$ yds.;

$$\therefore \text{ fraction} = \frac{5}{6 \times 1760} = \frac{1}{6 \times 352} = \frac{1}{2112}.$$

8. $\frac{1}{300}$ of £1 $= \frac{20 \times 12}{300}$ *d.*; $\therefore$ fraction $= \frac{20 \times 12}{300 \times 1} = \frac{12}{15} = \frac{4}{5}$.

$\frac{3}{9680}$ of a mile $= \frac{3 \times 1760}{9680}$ yards;

$$\therefore \text{ fraction} = \frac{3 \times 1760}{9680 \times 1} = \frac{3 \times 16}{88} = \frac{6}{11}.$$

9. $\frac{2}{5}$ of $\frac{4}{7}$ of 10*s.* 6*d.* $= \frac{2 \times 4 \times 21}{5 \times 7}$ sixpences, and 2*s.* 6*d.* $= 5$ sixpences;

$$\therefore \text{ fraction} = \frac{2 \times 4 \times 21}{5 \times 7 \times 5} = \frac{24}{25}.$$

1 lb. troy $= 5760$ grs.; $\therefore$ 1 oz. troy $= \frac{5760}{12}$ grs.

1 lb. av. $= 7000$ grs.; $\therefore$ 1 oz. av. $= \frac{7000}{16}$ grs.;

$$\therefore \text{ fraction} = \frac{5760 \times 16}{7000 \times 12} = \frac{576 \times 4}{700 \times 3} = \frac{192}{175}.$$

10. $\frac{3}{7}$ of a pole $= \frac{3}{7}$ po., and 1 league $= (3 \times 8 \times 40)$ po.;

$$\therefore \text{ fraction} = \frac{3}{7 \times 3 \times 8 \times 40} = \frac{1}{2240}.$$

$3\frac{7}{8}$ fur. $= \frac{31}{8}$ fur., and $2\frac{7}{8}$ miles $= 23$ fur.;

$$\therefore \text{ fraction} = \frac{31}{8 \times 23} = \frac{31}{184}.$$

11. $\frac{3}{5}$ of $7\frac{1}{2}$ of $16\frac{1}{2}$ yds. $= \frac{3 \times \overset{\text{yds.}}{15} \times 33}{5 \times 2 \times 2} = \frac{3 \times \overset{\text{yds.}}{3} \times 33}{4}$, and 1 furlong $= 220$ yds.;

$$\therefore \text{ fraction} = \frac{3 \times 3 \times 33}{4 \times 220} = \frac{27}{80}.$$

$\frac{1}{7}$ of $\frac{2}{11}$ of a guinea $= \frac{2 \times 21 \times 2}{7 \times 11}$ sixpences, and 2*s.* 6*d.* $= 5$ sixpences;

$$\therefore \text{ fraction} = \frac{2 \times 21 \times 2}{7 \times 11 \times 5} = \frac{12}{55}.$$

12. $\frac{7}{9}$ of 16*s.* 0½*d.* $= \frac{7 \times 385}{9}$ halfpence, and 17*s.* 6*d.* = 420 halfpence;

$$\therefore \text{ fraction} = \frac{7 \times 385}{9 \times 420} = \frac{385}{9 \times 60} = \frac{77}{108}.$$

$\frac{7}{316}$ of a lb. troy $= \frac{7 \times 12 \times 20}{316}$ dwts.;

$$\therefore \text{ fraction} = \frac{7 \times 12 \times 20}{316} = \frac{7 \times 3 \times 20}{79} = \frac{420}{79}.$$

13. $\frac{7}{8}$ of a lb. av. $= \overset{\text{grs.}}{\left(\frac{7}{8} \times 7000\right)} = (7 \times 875)$ grs., and 2 lbs. troy $= (2 \times 5760)$ grs.;

$$\therefore \text{ fraction} = \frac{7 \times 875}{2 \times 5760} = \frac{7 \times 175}{2 \times 1152} = \frac{1225}{2304}.$$

$\frac{7}{9}$ of 2*s.* 6*d.* $= \frac{7 \times 5}{9}$ sixpences, and 1½ guineas = 63 sixpences;

$$\therefore \text{ fraction} = \frac{7 \times 5}{9 \times 63} = \frac{5}{81}.$$

14. $\frac{5}{9}$ of a Fr. ell $= \frac{5 \times 6}{9}$ qrs., and 1 yd. = 4 qrs.;

$$\therefore \text{ fraction} = \frac{5 \times 6}{9 \times 4} = \frac{5}{6}.$$

$\frac{3}{8}$ of a crown $= \frac{3 \times 10}{8}$ sixpences, and $\frac{1}{3}$ of 7*s.* 6*d.* = 2*s.* 6*d.* = 5 sixpences;

$$\therefore \text{ fraction} = \frac{3 \times 10}{8 \times 5} = \frac{3}{4}.$$

15. $\frac{16}{23}$ of a sq. inch $= \frac{16}{23}$ sq. in., and 1 sq. yd. $= (9 \times 144)$ sq. in.;

$$\therefore \text{ fraction} = \frac{16}{23 \times 9 \times 144} = \frac{1}{23 \times 9 \times 9} = \frac{1}{1863}.$$

$\frac{1}{5}$ of a yd. $= \frac{4}{5}$ qrs., and 1 Eng. ell = 5 qrs.;

$$\therefore \text{ fraction} = \frac{4}{5 \times 5} = \frac{4}{25}.$$

16. $\frac{21}{15000}$ of a year $= \frac{21 \times 365}{15000}$ days;

$$\therefore \text{ fraction} = \frac{21 \times 365}{15000} = \frac{7 \times 73}{1000} = \frac{511}{1000}.$$

$\frac{\cdot036}{1875}£ = \frac{\cdot036 \times 12 \times 20 \times 4}{1875}$ farthings;

$$\therefore \text{ fraction} = \frac{\cdot 036 \times 12 \times 20 \times 4}{1875} = \frac{36 \times 12 \times 20 \times 4}{1000 \times 1875} = \frac{36 \times 12 \times 4}{50 \times 1875}$$

$$= \frac{12 \times 12 \times 2}{25 \times 625} = \frac{288}{15625}.$$

(3) 1. $\frac{2}{3}$ of a moidore = 18*s.*, and 7 guineas = (7×21)*s.*;

$$\therefore \text{ fraction} = \frac{18}{7 \times 21} = \frac{6}{49}.$$

2. $\frac{1}{2}$ of $\frac{9}{10}$ of 2*s.* 6*d.* $= \frac{9 \times 3}{2}$*d.*, and £9 = (9×240)*d.*

$$\therefore \text{ fraction} = \frac{9 \times 3}{2 \times 9 \times 240} = \frac{1}{160}.$$

3. $\frac{1}{100000}$ of a day $= \frac{24 \times 60 \times 60}{100000}$ seconds;

$$\therefore \text{ fraction} = \frac{24 \times 6 \times 6}{1000} = \frac{12 \times 9}{125} = \frac{108}{125}.$$

4. $\frac{7}{9}$ of a mile $= \frac{7}{9}$ mile, and $\frac{3}{4}$ league $= \frac{9}{4}$ mile;

$$\therefore \text{ fraction} = \frac{7 \times 4}{9 \times 9} = \frac{28}{81}.$$

5. $5\frac{5}{8}$ of $\frac{4}{15}$ of £7 $= \frac{45 \times 4 \times 7 \times 40}{8 \times 15}$ sixpences $= (3 \times 4 \times 7 \times 5)$ sixpences,

$4\frac{1}{2}$ guineas = $(168 + 21)$ sixpences = 189 sixpences;

$$\therefore \text{ fraction} = \frac{3 \times 4 \times 7 \times 5}{189} = \frac{4 \times 5}{9} = \frac{20}{9}.$$

6. $\frac{1}{2}$ of $5\frac{3}{5}$ sec. $= \frac{14}{5}$ seo., and 3wks. 4 days = 25 days = $(25 \times 24 \times 60 \times 60)$ sec.;

$$\therefore \text{ fraction} = \frac{14}{5 \times 25 \times 24 \times 60 + 60} = \frac{7}{5400000}.$$

7. $25\frac{9}{11}$ po. $= \frac{284}{11}$ po., and $\frac{1}{3}$ acre $= \frac{4 \times 40}{3}$ po.;

$$\therefore \text{ fraction} = \frac{284 \times 3}{11 \times 4 \times 40} = \frac{71 \times 3}{11 \times 40} = \frac{213}{440}.$$

8.
$$\frac{7}{183} \text{ of } 28 \text{ days} = \frac{7 \times 28 \times 24 \times 60}{183} \text{ min.};$$

$$\therefore \text{ fraction} = \frac{\frac{7}{183} \times 28 \times 24 \times 60}{\frac{1}{30}} = \frac{7 \times 28 \times 24 \times 60 \times 30}{183}$$

$$= \frac{7 \times 28 \times 24 \times 60 \times 10}{61} = \frac{2822400}{61}.$$

9.
$$3\tfrac{1}{4} \text{ hhds.} = \frac{13}{4} \text{ hhds., and } \frac{1}{3} \text{ of } 4 \text{ tuns} = \frac{4 \times 4}{3} \text{ hhds.};$$

$$\therefore \text{ fraction} = \frac{13 \times 3}{4 \times 4 \times 4} = \frac{39}{64}.$$

10.
$$\frac{3}{14} \text{ of } \frac{7}{3} \text{ of a pole} = \left(\frac{3}{14} \times \frac{7}{3} \times \frac{11}{2} \times 3\right) \text{ feet} = \frac{33}{4} \text{ feet},$$

$$3 \text{ fathoms} = (3 \times 6) \text{ ft.};$$

$$\therefore \text{ fraction} = \frac{33}{4 \times 3 \times 6} = \frac{11}{24}.$$

Ex. L. (p. 146.)

(1)
$$\frac{1}{19} \text{ of } £1 = \frac{20}{19}s. \qquad \frac{1}{20} \text{ of a guinea} = \frac{21}{20}s.$$

$$\frac{8}{35} \text{ of a crown} = \frac{8 \times 5}{35} s. = \frac{8}{7}s.;$$

∴ the fractions to be compared are

$$\frac{20}{19}, \ \frac{21}{20} \text{ and } \frac{8}{7},$$

and these become, since $19 \times 20 \times 7$ is L. C. Den.

$$\frac{2800}{2660}, \ \frac{2793}{2660}, \ \frac{3040}{2660}.$$

∴ $\frac{8}{35}$ of a crown is the greatest, $\frac{1}{19}$ of £1 the next, and $\frac{1}{20}$ of a guinea the least.

(2)
$$\frac{7}{8} \text{ of } £1 = 17s.\ 6d., \qquad \frac{5}{6} \text{ of } 21s. = \frac{5 \times 7}{2}s. = 17s.\ 6d.,$$

$$\frac{2}{3} \text{ of } 15s.\ 7\tfrac{1}{2}d. = \frac{1}{3} \text{ of } 31s.\ 3d. = 10s.\ 5d.;$$

∴ the first two are equal, the third less.

(3)
$$\frac{1}{25} \text{ of a day} = \frac{24}{25} \text{ hrs.};$$

$\therefore$ we have to compare the fractions

$$\frac{24}{25} \text{ and } \frac{6}{7}, \quad \text{or } \frac{168}{175} \text{ and } \frac{150}{175};$$

$\therefore \frac{1}{25}$ of a day is greater by $\frac{18}{175}$ of an hour.

(4)
$$\frac{1}{12} \text{ of } £1 - \frac{1}{14} \text{ of 1 guinea,}$$

$$= \left(\frac{20}{12} - \frac{21}{14}\right) s. = \left(\frac{5}{3} - \frac{3}{2}\right) s. = \frac{1}{6} s. = 2d., \text{ and } 2s.\ 6d. = 30d.;$$

$$\therefore \text{ fraction} = \frac{2}{30} = \frac{1}{15}.$$

(5)
$$\frac{7}{9} \text{ of } £1 - \frac{2}{5} \text{ of a guinea,}$$

$$= \left(\frac{7 \times 40}{9} - \frac{2 \times 42}{5}\right) \text{ sixpences} = \frac{644}{45} \text{ sixpences, and } 10s.\ 6d. = 21 \text{ sixpences};$$

$$\therefore \text{ fraction} = \frac{644}{45 \times 21} = \frac{92}{135}.$$

(6)
$$\frac{3}{8} \text{ of a crown} + \frac{4}{5} \text{ of a shilling} = \left(\frac{3 \times 5}{8} + \frac{4}{5}\right) s. = \frac{107}{40} s.;$$

$$\therefore \text{ fraction} = \frac{107}{40 \times 21} = \frac{107}{840}.$$

(7)
$$\frac{3}{8} \text{ of } 2s.\ 6d. + \frac{4}{5} \text{ of a guinea} + \frac{5}{3} \text{ of } £1 - \frac{1}{10} d.,$$

$$= \left(\frac{3 \times 30}{8} + \frac{4 \times 12 \times 21}{5} + \frac{5 \times 20 \times 12}{3} - \frac{1}{10}\right) d.,$$

$$= \left(\frac{45}{4} + \frac{1008}{5} + \frac{400}{1} - \frac{1}{10}\right) d. = \frac{12255}{20} d. = \frac{2451}{4} d.,$$

$$\text{and } £5 = (5 \times 20 \times 12) d.;$$

$$\therefore \text{ fraction} = \frac{2451}{5 \times 20 \times 12 \times 4} = \frac{817}{1600}.$$

(8)
$$\frac{3}{5} \text{ of } £3\ 7s.\ 6d. = \frac{1}{5} \text{ of } £10\ 2s.\ 6d. = £2\ 0s.\ 6d.,$$

$$\frac{2}{3} \text{ of } \frac{1}{4} \text{ of } 4\tfrac{1}{2} \text{ guineas} = \frac{3}{4} \text{ of } 21s. = 15s.\ 9d.;$$

$\therefore$ difference $= £2\ 16s.\ 3d. = 56\frac{1}{4}s.$, and $£2 = 40s.$;

$$\therefore \text{fraction} = \frac{225}{4 \times 40} = \frac{45}{4 \times 8} = \frac{45}{32}.$$

(9) 5 guineas − $3\frac{1}{2}$ guineas = $1\frac{1}{2}$ guineas;

$\therefore$ we have to reduce $1\frac{1}{2}$ guineas to the fraction of £10.

$$1\tfrac{1}{2} \text{ guineas} = \frac{3 \times 21}{2}s., \text{ and } £10 = 200s.;$$

$$\therefore \text{fraction} = \frac{63}{2 \times 200} = \frac{63}{400}.$$

(10)

$$\begin{array}{l} \text{1 ton 10 cwt.} \\ \qquad\qquad\quad \text{3 qrs. 14 lbs.} \\ \hline \text{1 ton 9 cwt. 0 qrs. 14 lbs.} = 3262 \text{ lbs.,} \end{array}$$

and $2\frac{1}{2}$ cwt. $= (\frac{5}{2} \times 112)$ lbs. $= 280$ lbs.;

$$\therefore \text{fraction} = \frac{3262}{280} = \frac{1631}{140} = \frac{233}{20}.$$

Ex. LI. (p. 150).

(1) 1.

$$\begin{array}{r} £. \\ \cdot 45 \\ 20 \\ \hline 9 \cdot 00\ s. \end{array}$$

Ans. 9*s.*

2.

$$\begin{array}{r} £. \\ \cdot 28125 \\ 20 \\ \hline 5 \cdot 62500\ s. \\ 12 \\ \hline 7 \cdot 50000\ d. \\ 4 \\ \hline 2 \cdot 00000\ q. \end{array}$$

Ans. 5*s.* 7½*d.*

$$\begin{array}{r} £. \\ \cdot 16875 \\ 20 \\ \hline 3 \cdot 37500\ s. \\ 12 \\ \hline 4 \cdot 50000\ d. \\ 4 \\ \hline 2 \cdot 00000\ q. \end{array}$$

Ans. 3*s.* 4½*d.*

$$\begin{array}{r} £. \\ \cdot 7962 \\ 20 \\ \hline 15 \cdot 9240\ s. \\ 12 \\ \hline 11 \cdot 0880\ d. \end{array}$$

Ans. 15*s.* 11*d.* ·088.

$$\begin{array}{r} £. \\ \cdot 87708 \\ 20 \\ \hline 17 \cdot 54160\ s. \\ 12 \\ \hline 6.49920\ d. \\ 4 \\ \hline 1 \cdot 99680\ q. \end{array}$$

Ans. 17*s.* 6¼*d.* ·9968*q.*

$$\begin{array}{r} £. \\ \cdot 359375 \\ 40 \\ \hline 14 \cdot 375000\ s. \\ 12 \\ \hline 4 \cdot 500000\ d. \\ 4 \\ \hline 2 \cdot 000000\ q. \end{array}$$

Ans. 14*s.* 4½*d.*

3.
£.
5·00625
20
·12500 s.
12
1·50000 d.
4
2·00000 q.

Ans. £5 0s. 1½d.

£.
·775625
5
3·878125 £.
20
17·562500 s.
12
6·750000 d.
4
3·000000 q.

Ans. £3 17s. 6¾d.

·6875
16
41250
6875
11·0000 s.

Ans. 11s.

4.
guinea
·0625
21
625
1250
13·125 s.
12
1·500 d.
4
2·000 q.

Ans. 13s. 1½d.

s.
·7635
10
7·635 s.
12
7·620
4
2·480

Ans. 7s. 7½d. ·48q.

s.
2·625
12
7·500 d.
4
2·000 q.

Ans. 2s. 7½d.

5.
guinea
·056713
21
56713
113426
1·190973 s.
12
2·291676 d.
4
1·166714 q.

Ans. 1s. 2¼d. ·166714q.

£.
2·76543
20
15·30860 s.
12
3·70320 d.
4
2·81280 q.

Ans. £2 15s. 3½d. ·8128q.

&.
1·74375
10
17·4375 s.
12
5·2500 d.
4
1·0000 q.

Ans. 17s. 5¼d.

6.
£.
3·049
20
·980 *s.*
12
11·760 *d.*
4
3·040 *q.*

Ans. £3 0*s.* 11$\frac{3}{4}$*d.* ·04*q.*

£.
·0425
100
4·25 £.
20
5·00 *s.*

Ans. £4 5*s.*

d.
·432
160
25920
432
69·120 *d.*

Ans. 5*s.* 9·12*d.*

7.
s.
·1875
105
9375
18750
19·6875 *s.*
12
8·2500 *d.*
4
1·0000 *q.*

Ans. 19*s.* 8$\frac{1}{4}$*d.*

d.
1·05625
80
84·50000 *d.*
4
2·00000 *q.*

Ans. 7*s.* 0$\frac{1}{2}$*d.*

d.
·875
786
5250
7000
6125
687·750 *d.*
4
3·000

Ans. £2 17*s.* 3$\frac{3}{4}$*d.*

8.
d.
3·10532
·150
15526600
310532
465·79800 *d.*
4
3·19200 *q.*

Ans. £1 18*s.* 9$\frac{3}{4}$*d.* ·192*q.*

d.
27·5
28
2200
550
770·0 *d.*

Ans. £3 4*s.* 2*d.*

d.
41·375
8
331·000 *d.*

Ans. £1 7*s.* 7*d.*

10.
£.
6·156510416
4
24·626041664 £.
20
12·520833280 *s.*
12
6·249999360 *d.*

Ans. £24 12*s.* 6·24999936*d.*

lb.
·046875
96
281250
421875
4·500000

Ans. 4$\frac{1}{2}$ lbs.

11. cwt.
·85076
4
3·40304 qrs.
28
322432
80608
11·28512 lbs.
16
171072
28512
4.56192 oz.
Ans. 3 qrs. 11 lbs. 4·56192 oz.

cwt.
·07325
4
·29300 qrs.
28
234400
58600
8·20400 lbs.
16
122400
20400
3·26400 oz.
Ans. 8 lbs. 3·264 oz.

mile
·045
8
·360 fur.
40
14·400 po.
5½
2000
200
2·200 yds.
36
7·200 in.
Ans. 14 po. 2 yds. 7·2 in.

12. tons
4·16525
20
3·30500 cwt.
4
1·22000 qrs.
28
6·16000 lbs.
16
2·56000 oz.
Ans. 4 tons 3 cwt. 1 qr. 6 lbs. 2·56 oz.

cwt.
3.625
4
2·500 qrs.
28
14·000 lbs.
Ans. 3 cwt. 2 qrs. 14 lbs.

acre
.05
4
·20 ro.
40
8·00 po.
Ans. 8 sq. poles.

9. league
·875
3
2·625 mi.
1760
37500
4375
625
1100·000 yds.
Ans. 2 mi. 1100 yds.

days
2·5384375
24
21537500
10768750
12·9225000 hrs.
60
55·3500 m.
60
21·00 sec.
Ans. 2 days 12 hrs. 55 min. 21 sec.

lb. troy
·6
12
7·2 oz.
20
4·0 dwts.
Ans. 7 oz. 4 dwts.

13.

```
   lbs. troy
   3·8343
       12
  --------
  10·0116  oz.
       20
  --------
    ·2320 dwts.
       24
  --------
     9280
    4640
  --------
   5·5680 grs.
```

Ans. 3 lbs. 10 oz. 5·568 grs.

```
     qrs.
   2·46875
         8
  ---------
   3.75000 bush.
         4
  ---------
   3·00000 pks.
```

Ans. 2 qrs. 3 bus. 3 pks.

```
        lbs.
       4·106
         385
     --------
       20530
      32848
     12318
   -----------
    1580·810 lbs.
          16
   -----------
        4860
        810
   -----------
      12·960 oz.
```

Ans. 1580 lbs. 12·96 oz.
= 14 cwt. 12 lbs. 12·96 oz.

14.

```
     ac.
   3·8375
        4
  --------
   3·3500 ro.
       40
  --------
  14·0000 po.
```

Ans. 3 ac. 3 ro. 14 po.

```
   gall.
    3·5
     18
  ------
    280
    35
  ------
   63·0 gall.
```

Ans. 63 gallons.

15.

```
     fur.
     ·925
       40
  --------
   37·000 po.
```

Ans. 37 poles.

```
    lun. mo.
    ·34375
        28
  ----------
    275000
    68750
  ----------
   9·62500 days
        24
  ----------
    250000
   125000
  ----------
  15·00000 hrs.
```

Ans. 9 days 15 hrs.

20.

```
     miles
   2·009943
          2
  ----------
   4·019886  mi.
          8
  ----------
    ·159088  fur.
         40
  ----------
   6·363520 po.
         5½
  ----------
    1817600
    181760
  ----------
   1·999360 yds.
          3
  ----------
   2·998080 ft.
         12
  ----------
  11·976960 in.
```

Ans. 4mi. 6po. 1yd. 2ft. 11·97696in.

```
      s.
    1·005
      315
   -------
     5025
    1005
   3015
  ---------
  316·575 s.
       12
  ---------
    6·900 d.
        4
  ---------
    3·600 q.
```

Ans. £15 16*s.* 6¾*d.*·6*q.*

16.
£.
5·06325
100
506·325 £.
20
6·500 *s.*
12
6·000 *d.*

Ans. £506 6*s.* 6*d.*

Eng. ell
3·8
5
19·0 qrs.

Ans. 19 qrs.

19.
sq. ft.
4·751
25
23755
9502
118·775 sq. ft.
144
3100
3100
775
111·600 sq. in.

Ans. 13 sq. yds. 1 sq. ft. 111·6 sq. in.

q.
60493
3·0005
30·2465
120986
121016·2465 *q.*

4 | 121016
12 | 30254
2,0 | 252,1 – 2*d.*

Ans. £126 1*s.* 2*d.* ·2465*q.*

17.
ro.
2·25
14
900
225
31·50 ro.
40
20·00 po.

Ans. 7 ac. 3 ro. 20 po.

s.
2·465
25
12325
4930
61·625 *s.*
12
7·500 *d.*
4
2·000 *q.*

Ans. £3 1*s.* 7½*d.*

18.
sixpences
1·605
125
8025
3210
1605
200·625 sixpences
6
3·750 *d.*
4
3·000 *q.*

Ans. £5 0*s.* 3¾*d.*

yards
2·0396
2290
1835640
40792
40792
4670·6840 yds.
3
2·0520 ft.

Ans. 2 m. 1150 yds. 2·052 ft.

(2) 1.

$$\cdot 38\dot{3} \text{ of } £1 = \frac{383 - 38}{900} \text{ of } £1 = \frac{345}{900} \text{ of } £1$$

$$= \frac{345 \times 20}{900} s. = \frac{23}{3} s. = 7s.\ 8d.$$

$\cdot 4708\dot{3}$ of £1 $= \frac{47083 - 4708}{90000}$ of £1

$= \frac{42375 \times 20}{90000}$ *s.* $= \frac{113}{12}$ *s.* = 9*s.* 5*d.*

$\cdot 469\dot{4}$ of 1 lb. troy $= \frac{4694 - 469}{9000}$ of 1 lb. troy

$= \frac{4225}{9000}$ lb. troy $= \frac{169 \times 12}{360}$ oz.

$= \frac{169}{30}$ oz. = 5 oz. 12 dwts. 16 grs.

2. $\cdot 5\dot{7}4\dot{0}$ of 27*s.* $= \frac{5740 - 5}{9990}$ of 27*s.*

$= \frac{5735 \times 27}{9990}$ *s.* $= \frac{1147}{74}$ *s.* = 15*s.* 6*d.*

$\cdot 13\dot{8}$ of 10*s.* 6*d.* $= \frac{138 - 13}{900}$ of 126*d.*

$= \frac{125 \times 126}{900}$ *d.* $= \frac{35}{2}$ *d.* = 1*s.* 5½*d.*

2·6 of 5*s.* $= 2\frac{6}{9}$ of 5*s.* $= 2\frac{2}{3}$ of 5*s.*

$= \frac{40}{3}$ *s.* = 13*s.* 4*d.*

3. $\cdot \dot{1}4285\dot{7}$ of 2 guineas $= \frac{142857}{99999}$ of 42*s.*

$= \frac{12987 \times 42}{90909}$ *s.* $= \frac{1443 \times 42}{10101}$ *s.*

$= \frac{1443 \times 6}{1443}$ *s.* = 6*s.*

$\cdot 2\dot{0}9532\dot{8}$ of 17*s.* 6*d.* $= \frac{2095328 - 2}{9999990}$ of 17*s.* 6*d.*

$= \left(\frac{2095326}{9999990} \times \frac{35}{2}\right)$ *s.* $= \frac{407}{111}$ *s.* = 3*s.* 8*d.*,

and 17*s.* 6*d.* × 3 = £2 12*s.* 6*d.*;

∴ value required = £2 12*s.* 6*d.* + 3*s.* 8*d.* = £2 16*s.* 2*d.*

4. $\cdot 06\dot{3}$ of 100 guineas $= \left(\frac{63 - 6}{900} \times 100\right)$ guineas

$= \frac{57}{9}$ guineas = 6 guineas 7*s.* = £6 13*s.*

$$2{\cdot}013\dot{8} \text{ of } 3{\cdot}5 \text{ moidores} = 2\,\frac{138-13}{9000} \text{ of } 3{\cdot}5 \text{ moidores}$$

$$= \left(2\tfrac{125}{9000} \times \frac{7}{2} \times 27\right)s. = \left(2\tfrac{1}{72} \times \frac{7}{2} \times 27\right)s. = \frac{145 \times 7 \times 27}{72 \times 2}s.$$

$$= \frac{3045}{16}s. = \pounds 9\ 10s.\ 3\tfrac{3}{4}d.$$

5. $$4{\cdot}0\dot{5} \text{ of } 1\tfrac{1}{2} \text{ sq. yds.} = \left(4\tfrac{5}{90} \times \frac{3}{2}\right) \text{sq. yds.}$$

$$= \left(4\tfrac{1}{18} \times \frac{3}{2}\right) \text{sq. yds.} = \frac{73}{12} \text{sq. yds.} = 6 \text{ sq. yds. } 108 \text{ sq. in.};$$

$$\cdot 16\dot{3} \text{ of } 2\tfrac{1}{2} \text{ miles} = \frac{163-16}{900} \text{ of } 2\tfrac{1}{2} \text{ miles}$$

$$= \left(\frac{147}{900} \times \frac{5}{2}\right) \text{miles} = \frac{147}{180 \times 2} \text{ miles}$$

$$= \frac{49}{120} \text{ miles} = 3 \text{ fur. } 10 \text{ po. } 3 \text{ yds. } 2 \text{ ft.};$$

$$4{\cdot}\dot{9}\dot{0} \text{ of } 4 \text{ days } 3 \text{ hrs.} = 4\tfrac{90}{99} \text{ of } 99 \text{ hrs.}$$

$$= \frac{396+90}{99} \text{ of } 99 \text{ hrs.} = 486 \text{ hrs.} = 20 \text{ days } 6 \text{ hrs.}$$

6. $$3{\cdot}24\dot{2} \text{ of } 2\tfrac{1}{2} \text{ acres} = \left(3\,\frac{242-24}{900} \times \frac{5}{2}\right) \text{acres}$$

$$= \left(3\tfrac{109}{450} \times \frac{5}{2}\right) \text{acres} = \frac{1459}{180} \text{ acres} = 8\tfrac{19}{180} \text{ acres};$$

$$\frac{\cdot 093\dot{1}\dot{8}}{\cdot 56\dot{8}\dot{1}} \text{ of } 2\tfrac{1}{12} \text{ of } 2{\cdot}5 \text{ days} = \left(\frac{9318-93}{99000} \times \frac{9900}{5681-56} \times \frac{25}{12} \times \frac{5}{2}\right) \text{days}$$

$$= \left(\frac{9225}{10} \times \frac{1}{5625} \times \frac{25}{12} \times \frac{5}{2}\right) \text{days} = \frac{41}{48} \text{ days} = 20 \text{ hrs. } 30 \text{ min.}$$

(3)

$$\begin{array}{r} \pounds. \\ \cdot 77777 \\ 20 \\ \hline 15{\cdot}55540\,s. \\ 12 \\ \hline 6{\cdot}6480\,d. \end{array} \qquad\qquad \begin{array}{rrcl} & s. & & d. \\ & 15 & . & 6{\cdot}648 \\ & 8 & . & 6{\cdot}648 \\ \cline{2-4} \textit{Ans.} & 7 & . & 0 \end{array}$$

$$\begin{array}{r} \pounds. \\ \cdot 70323 \\ 20 \\ \hline 14{\cdot}06460\,s. \\ 12 \\ \hline \cdot 77520\,d. \end{array} \qquad\qquad \begin{array}{r} s. \\ 3{\cdot}5646 \\ 12 \\ \hline 6{\cdot}7752\,d. \end{array} \qquad\qquad \begin{array}{rrcl} & s. & & d. \\ & 14 & . & 0{\cdot}7752 \\ & 3 & . & 6{\cdot}7752 \\ \cline{2-4} \textit{Ans.} & 10 & . & 6 \end{array}$$

(4) £.
1·59375
20
11·87500 *s.*
12
10·50000 *d.*
4
2·00000 *q.*

$\frac{3}{8}$ of 5*s.* = $\frac{15}{8}$*s.*
= 1*s.* $10\frac{1}{2}$*d.*

	£.	*s.*	*d.*
	1	11	$10\frac{1}{2}$
	0	1	$10\frac{1}{2}$
Ans.	1	10	0

(5) 1. £.
·68125
20
13·62500 *s.*
12
7·50000 *d.*
4
2·00000 *q.*

d.
·375
160
22500
375
60·000 *d.*

d.
·605
750
30250
4235
453·750 *d.*
4
3·000 *q.*

therefore, value = 13*s.* $7\frac{1}{2}$*d.* + 5*s.* + £1 17*s.* $9\frac{3}{4}$*d.* = £2 16*s.* $5\frac{1}{4}$*d.*

2. $3\frac{7}{8}$ of 6*s.* 8*d.* = $(\frac{31}{8} \times 80)$*d.* = 310*d.* = £1 5*s.* 10*d.*;

$$\cdot 4097\dot{2} \text{ of a guinea} = \left(\frac{40972-4097}{90000} \times 21\right)s.$$

$$= \left(\frac{36875}{30000} \times 7\right)s. = \frac{413}{48}s. = 8s.\ 7\tfrac{1}{4}d.$$

£.
2·75
30
82·50 £
20
10·00 *s.*

therefore, value = £1 5*s.* 10*d.* − 8*s.* $7\frac{1}{4}$*d.* + £82 10*s.* = £83 7*s.* $2\frac{3}{4}$*d.*

3. £.
·634375
20
12·68750 *s.*
12
8·250000 *d.*
4
1·000000 *q.*

s.
·025
25
125
50
·625 *s.*
12
7·500 *d.*
4
2·000 *q.*

$\cdot 31\dot{6}$ of 30*s.*

$$= \frac{316-31}{900} \text{ of } 30s.$$

$$= \frac{285}{30}s.$$

$$= \frac{19}{2}s.$$

= 9*s.* 6*d.*

therefore, value = 12*s.* $8\frac{1}{4}$*d.* + $7\frac{1}{2}$*d.* + 9*s.* 6*d.* = £1 2*s.* $9\frac{3}{4}$*d.*

4.
$$\begin{array}{r} d. \\ \cdot75 \\ 80 \\ \hline 60{\cdot}00\,d. \end{array} \qquad \begin{array}{r} s. \\ 1{\cdot}84375 \\ 4 \\ \hline 7{\cdot}37500\,s. \\ 12 \\ \hline 4{\cdot}50000\,d. \\ 4 \\ \hline 2{\cdot}00000\,q. \end{array}$$

$3{\cdot}979\dot{6}$ of $2s.$

$=6s.+\frac{8817}{4500}s.$

$=7s.\ 11\frac{1}{2}d.\ \frac{6}{125}q.$

therefore, value $=5s.-7s.\ 4\frac{1}{2}d.+7s.\ 11\frac{1}{2}d.\ \frac{6}{125}q.$

$=5s.\ 7d.\ \frac{6}{125}q.=5s.\ 7\frac{6}{500}d.=5s.\ 7{\cdot}012d.$

5. $2{\cdot}\dot{8}\dot{1}$ of $365\frac{1}{4}$ days $=\left(2\frac{81}{99}\times\frac{1461}{4}\right)$ days

$=\left(\frac{31\times1461}{11\times4}\right)$ days $=147$ wks. 0 days 8 hrs. 10 m. $54\frac{6}{11}$ sec.

$$\begin{array}{r} \text{wks.} \\ 5{\cdot}75 \\ 7 \\ \hline 5{\cdot}25 \text{ days} \\ 24 \\ \hline 6{\cdot}00 \text{ hrs.} \end{array}$$

$\frac{3}{4}$ of $5\frac{5}{9}$ hrs. $=\frac{3\times50}{4\times9}$ hrs.

$=\frac{25}{6}$ hrs. $=4$ hrs. 10 m.

therefore, value

$=147$ wks. 0 days 8 hrs. 10 m. $54\frac{6}{11}$ sec. $+5$ wks. 5 days 6 hrs. -4 hrs. 10m.

$=152$ wks. 5 days 10 hrs. 0 m. $54\frac{6}{11}$ sec.

6. $\frac{7}{9}$ of $\frac{3}{14}$ of 3 ac. $=\frac{7\times3\times3}{9\times14}$ ac. $=\frac{1}{2}$ ac. $=2$ ro.

$$\begin{array}{r} \text{sq. yds.} \\ 2{\cdot}00875 \\ 9 \\ \hline \cdot07875 \text{ sq. ft.} \\ 144 \\ \hline 31500 \\ 31500 \\ 7875 \\ \hline 11{\cdot}34000 \text{ sq. in.} \end{array}$$

$\cdot02\dot{2}\dot{7}$ of $3\frac{1}{2}$ sq. ft.

$=\left(\frac{225}{9900}\times\frac{7}{2}\right)$ sq. ft.

$=\frac{225\times7\times144}{9900\times2}$ sq. in.

$=\frac{5\times7\times18}{55}$ sq. in.

$=11\frac{5}{11}$ sq. in.

therefore, value $=2$ ro -2 sq. yds. $11\frac{17}{50}$ sq. in. $+11\frac{5}{11}$ sq. in.

$=1$ ro. 39 po. $28\frac{1}{4}$ sq. yds. $0\frac{63}{550}$ sq. in.

(6) $\cdot0231$ of a guinea $=\frac{231\times21}{10000}s.=\frac{4851}{10000}s.;$

$\cdot19$ of half-a-crown $=\frac{19\times5}{100\times2}s.=\frac{4750}{10000}s.;$

therefore, $\cdot0231$ of a guinea is the greater.

Ex. LII. (p. 154.)

(1) 1.

$$\begin{array}{r|l} 12 & 4\cdot00 \\ \hline 2,0 & 6\cdot333\dot{3} \\ \hline & \cdot316\dot{6} \end{array} \qquad \begin{array}{r|l} 2 & 1\cdot0 \\ \hline 12 & 8\cdot5 \\ \hline 2,0 & 8\cdot7083\dot{3} \\ \hline & \cdot435416\dot{6} \end{array}$$

2.

$$\begin{array}{r|l} 4 & 2\cdot0 \\ \hline 12 & 7\cdot5 \\ \hline 2,0 & 4\cdot625 \\ \hline & \cdot23125 \end{array} \qquad \begin{array}{r|l} 4 & 1\cdot00 \\ \hline 12 & 11\cdot25 \\ \hline 2,0 & 15\cdot9375 \\ \hline & \cdot796875 \end{array}$$

3.

$$\begin{array}{r|l} 2 & 1\cdot0 \\ \hline 12 & 4\cdot5 \\ \hline 5 & 3\cdot375 \\ \hline & \cdot675 \end{array} \qquad \begin{array}{r|l} 4 & 3\cdot00 \\ \hline 12 & .75 \\ \hline 2,0 & \cdot0625 \\ \hline & \cdot003125 \end{array}$$

4.

$$\begin{array}{r|l} 4 & 3\cdot00 \\ \hline 12 & \cdot75 \\ \hline 2,0 & 10\cdot0625 \\ \hline & \cdot503125 \end{array} \qquad \begin{array}{r|l} 4 & 3\cdot00 \\ \hline 12 & 8\cdot75 \\ \hline 2,0 & 5\cdot7291\dot{6}\dot{6} \\ \hline 5 & \cdot286458\dot{3} \\ \hline & \cdot057291\dot{6} \end{array}$$

5.

$$\begin{array}{r|l} 4 & 1\cdot00 \\ \hline 12 & 3\cdot25 \\ \hline 15\,\{\,3 & 1\cdot2708\dot{3} \\ \hline 5 & \cdot4236\dot{1} \\ \hline & \cdot0847\dot{2} \end{array} \qquad \begin{array}{r|l} 4 & 2\cdot0 \\ \hline 12 & 1\cdot5 \\ \hline 21\,\{\,3 & 12\cdot125 \\ \hline 7 & 4\cdot041\dot{6} \\ \hline & \cdot577\dot{3}80952\dot{3}80 \end{array}$$

6. *5s.* = 60*d.*, and 13*s.* 4*d.* = 160*d.*;

therefore, fraction $= \frac{60}{160} = \frac{3}{8} = \cdot375$.

$$\begin{array}{r|l} 12 & 9\cdot00 \\ \hline 27\,\{\,3 & 18\cdot75 \\ \hline 9 & 6\cdot25 \\ \hline & \cdot69\dot{4} \end{array}$$

7.

$$\begin{array}{r|l} 12 & 6\cdot0 \\ \hline 10 & 13\cdot5 \\ \hline & 1\cdot35 \end{array} \qquad \begin{array}{r|l} 4 & 2\cdot0 \\ \hline 12 & 4\cdot5 \\ \hline 2,0 & 9\cdot375 \\ \hline & 1\cdot46875 \end{array}$$

8.

$$\begin{array}{r|l} 4 & 3\cdot00 \\ \hline 12 & 9\cdot75 \\ \hline 2,0 & 11\cdot8125 \\ \hline & 3\cdot590625 \end{array} \qquad \begin{array}{r|l} 4 & 3\cdot00 \\ \hline 12 & 9\cdot75 \\ \hline 5,0 & 71\cdot8125 \\ \hline & 1\cdot43625 \end{array}$$

9.

$$\begin{array}{r|l} 4 & 3\cdot00 \\ \hline 12 & \cdot75 \\ \hline 21\,\{\,3 & 14\cdot0625 \\ \hline 7 & 4\cdot6875 \\ \hline 3 & \cdot6696\dot{4}2857\dot{1} \\ \hline & \cdot2232\dot{1}4285\dot{7} \end{array}$$

27*s.* = 54 sixpences,

$1\frac{1}{2}$ guineas = 63 sixpences ;

therefore, fraction $= \frac{54}{63} = \frac{6}{7}$

$= \cdot\dot{8}5714\dot{2}$.

10. $6\frac{1}{2}$ guineas = 273 sixpences, and £5 = 200 sixpences ;

therefore, fraction $= \frac{273}{200} = \frac{2\cdot73}{2} = 1\cdot365$;

$$\begin{array}{r|l} 4 & 2\cdot0 \\ \hline 12 & 1\cdot5 \\ \hline 2{,}0 & \cdot125 \\ \hline 100 & \cdot00625 \\ \hline & \cdot0000625 \end{array}$$

11. £8 0*s.* 10*d.* = 1930*d.* and $5\frac{1}{2}d. = \frac{11}{2}d.$,

therefore, fraction $= \frac{1930\times2}{11} = \frac{3860}{11} = 350\cdot\dot{9}\dot{0}$;

7 guineas = 1764*d.* and £5 10*s.* 11*d.* = 1331*d.*,

therefore, fraction $= \frac{1764}{1331} = 1\cdot325319308\ldots.$

12.

$$\begin{array}{r|l} 2{,}0 & 13\cdot00 \\ \hline 12 & 2\cdot65 \\ \hline & \cdot2208\dot{3} \end{array}$$

4 lbs. 2 scr. = 1154 scr.,

1 oz. = 24 scr.;

therefore, fraction $= \frac{1154}{24} = \frac{577}{12} = 48\cdot08\dot{3}$.

13.

$$\begin{array}{r|l} 28\,\{\,4 & 21\cdot00 \\ \hline 7 & 5\cdot25 \\ \hline 4 & 2\cdot75 \\ \hline 2{,}0 & \cdot6875 \\ \hline & \cdot034375 \end{array}$$

$$\begin{array}{r|l} 16\,\{\,4 & 3\cdot00 \\ \hline 4 & \cdot75 \\ \hline 28\,\{\,4 & \cdot1875 \\ \hline 7 & \cdot046875 \\ \hline 4 & \cdot006696\dot{4}285\dot{7}1428.. \\ \hline 10 & 3\cdot001674107142857 \\ \hline & \cdot3001674107142857 \end{array}$$

14.

$$\begin{array}{r|l} 5\frac{1}{2} & 41 \\ 2 & 2 \\ \hline 11 & 82\cdot00 \\ \hline 4{,}0 & 7\cdot\dot{4}\dot{5} \\ \hline 8 & 2\cdot181\dot{6}\dot{3} \\ \hline & \cdot273295\dot{4}\dot{5} \end{array}$$

$$\begin{array}{r|l} 4{,}0 & 30\cdot0 \\ \hline 8 & 1\cdot75 \\ \hline 3 & \cdot21875 \\ \hline & \cdot07291\dot{6} \end{array}$$

15.
$$144\left\{\begin{array}{r}12\\12\end{array}\right.\begin{array}{|l}\underline{73\cdot000}\\ \underline{\;6\cdot08\dot{3}}\end{array}\qquad\qquad\begin{array}{r|l}4{,}0&\underline{20\cdot0}\\4&\underline{\;3\cdot5}\\ &\;\cdot875\end{array}$$
$$\begin{array}{r|l}9&\underline{\;2\cdot5069\dot{4}\qquad\qquad}\\ &\;\cdot2785\dot{4}9382716\dot{0}\end{array}$$

16.
$$\begin{array}{r|l}4&\underline{\;2\cdot0}\\36\left\{\begin{array}{r}4\\9\end{array}\right.&\begin{array}{l}\underline{14\cdot5}\\ \underline{\;3\cdot625}\end{array}\\ &\;\cdot402\dot{7}\end{array}\qquad\qquad\begin{array}{r|l}4&\underline{3\cdot00}\\8&\underline{\;\cdot75}\\5&\underline{3\cdot09375}\\ &\;\cdot61875\end{array}$$

17.
$$\begin{array}{r|l}28\left\{\begin{array}{r}4\\6\end{array}\right.&\begin{array}{l}\underline{18\cdot0}\\ \underline{\;4\cdot5}\end{array}\\7&\underline{\;4\cdot75\qquad}\\ &\;\cdot67\dot{8}5714\dot{2}\end{array}\qquad\qquad\begin{array}{r|l}6{,}0&\underline{11\cdot0}\\6{,}0&\underline{\;\cdot18\dot{3}}\\24\left\{\begin{array}{r}4\\6\end{array}\right.&\begin{array}{l}\underline{\;\cdot0305\dot{5}}\\ \underline{\;\cdot007638\dot{8}}\end{array}\\5&\underline{\;\cdot0012731\dot{1}4\dot{8}}\\ &\;\cdot00025462\dot{9}6\dot{6}\end{array}$$

18. $1\frac{1}{3}$ guineas $= 28s.$ and £$1\frac{1}{2} = 30s.$,

therefore fraction $= \frac{28}{30} = \frac{2\cdot8}{3} = \cdot9\dot{8}$;

1 lb. Troy = 5760 grs. and 1 lb. Av. = 7000 grs.,

therefore fraction $= \frac{5760}{7000} = \frac{5\cdot76}{7} = \cdot82\dot{2}8571\dot{4}$.

19. $2\frac{1}{8}$ inches $= \frac{17}{8}$ in.,

$2\frac{1}{5}$ miles $= (\frac{11}{5} \times 1760 \times 3 \times 12)$ inches,

$= (11 \times 352 \times 3 \times 12)$ inches;

therefore fraction $= \frac{17}{8 \times 11 \times 352 \times 3 \times 12} = \frac{17}{1115136} = \cdot000015\ldots\ldots$

1 st. $6\frac{1}{2}$ lbs. $= 20\frac{1}{2}$ lbs $= \frac{41}{2}$ lbs., and $3\frac{1}{2}$ lbs. $= \frac{7}{2}$ lbs.

therefore fraction $= \frac{41}{7} = 5\cdot\dot{8}5714\dot{2}$.

20. $3\frac{3}{4}$ pks. $= \frac{15}{4}$ pks. and $3\frac{1}{2}$ qrs. $= (7 \times 16)$ pks.;

therefore fraction $= \frac{15}{4 \times 7 \times 16} = \frac{3\cdot75}{7 \times 16} = \frac{\cdot9375}{7 \times 4}$

$= \frac{\cdot234375}{7} = \cdot03348\dot{2}14285\dot{7}$;

$27\frac{1}{2}$ galls. = 110 qts. and $1\frac{1}{3}$ qts. $= \frac{4}{3}$ qts.;

therefore, fraction $= \frac{110 \times 3}{4} = \frac{330}{4} = 82\cdot5$.

21. $5\frac{3}{4}$ yds. $= 23$ qrs., and 2 F. ells $= 12$ qrs.,

therefore fraction $= \frac{23}{12} = 1\cdot91\dot{6}$;

1 ton $2\frac{1}{4}$ cwt $= 22\frac{1}{4}$ cwt. $= 89$ qrs., and 1 cwt. $2\frac{1}{4}$ qrs. $= \frac{25}{4}$ qrs.,

$$\text{therefore fraction} = \frac{89 \times 4}{25} = \frac{356}{25} = \frac{71\cdot2}{5} = 14\cdot24.$$

22. 3 wks. $5\frac{1}{4}$ d. $= 26\frac{1}{4}$ d. $= 630$ hrs., and $5\frac{1}{2}$ hrs. $= \frac{11}{2}$ hrs.,

$$\text{therefore fraction} = \frac{630 \times 2}{11} = \frac{1260}{11} = 114\cdot\dot{5}\dot{4};$$

1 min. $2\frac{1}{4}$ sec. $= 62\frac{1}{4}$ sec. $= \frac{249}{4}$ sec.,

$\frac{1}{25}$ of a lun. month $= (\frac{1}{25} \times 29\frac{1}{2} \times 24 \times 60 \times 60)$ sec.

$= (29\frac{1}{2} \times 24 \times 12 \times 12)$ sec.,

$$\text{therefore, fraction} = \frac{249}{4 \times 59 \times 12 \times 144} = \frac{249}{407808} = \cdot00061\ldots.$$

23. 3 reams $= (3 \times 20 \times 24)$ sheets $= 1440$ sheets;

therefore fraction $= \frac{1440}{19} = 75\cdot789\ldots\ldots$

$3\frac{1}{2}$ acres $= (\frac{7}{2} \times 4 \times 40 \times 30\frac{1}{4})$ sq. yds. $= (7 \times 20 \times 121)$ sq. yds.;

$$\text{therefore fraction} = \cfrac{7 \times 20 \times 121}{\cfrac{13}{4}} = \frac{7 \times 80 \times 121}{13}$$

$$= \frac{67760}{13} = 5212\cdot\dot{3}0769\dot{2}.$$

24.

$$1760\left\{\begin{array}{r|r} 10 & 33 \\ 4 & 3\cdot3 \\ 4 & \cdot825 \\ 11 & \cdot20625 \\ & \cdot01875 \end{array}\right.$$

$3s.\ 5\frac{11}{200}d. = 41\frac{11}{200}d. = \frac{8211}{200}d.$; $4s.\ 3d. = 51d.$,

$$\text{therefore fraction} = \frac{8211}{200 \times 51} = \frac{161}{200} = \cdot805,$$

$7s.\ 8\frac{1942}{10000}d. = 92\frac{1942}{10000}d. = \frac{921942}{10000}d.$; $10s.\ 6d. = 126d.$;

$$\text{therefore, fraction} = \frac{921942}{126 \times 10000} = \frac{7317}{10000} = \cdot7317.$$

(2) 1. $\frac{2}{3}$ of $13s.\ 6d. = 9s.$ and £$1 = 20s.$,

$$\text{therefore, fraction} = \frac{9}{20} = \cdot45;$$

$\frac{6}{7}$ of $2\frac{1}{2}s. = \frac{15}{7}s.$,

$$\text{therefore, fraction} = \frac{15}{7} = 2\cdot\dot{1}4285\dot{7}.$$

2. $\frac{5}{8}$ of a crown $= \frac{8}{5\times5}$ *s.*,

therefore, fraction $= \frac{25}{8\times21} = \frac{3\cdot125}{21} = \frac{1\cdot041\dot{6}}{7} = \cdot148\dot{8}0952\dot{3}$;

$$\begin{array}{r|l} 3 & 2\cdot0 \\ \hline 2,0 & 6\cdot6\dot{6} \\ \hline & \cdot3\dot{3} \end{array}$$

3. $\frac{15}{56}$ of a guinea $= \frac{15\times21}{56}$ *s.*,

therefore, fraction $= \frac{15\times21}{56\times20} = \frac{9}{8\times4} = \frac{1\cdot125}{4} = \cdot28125$;

2 qrs. $= (2\times8\times4)$ pks.,

therefore, fraction $= \frac{7}{8\times2\times8\times4} = \frac{\cdot875}{8\times8} = \frac{\cdot109375}{8} = \cdot013671875$.

4. $\frac{3}{7}$ of a guinea $= 9$*s.* and £2 $= 40$*s.*,

therefore, fraction $= \frac{9}{40} = \cdot225$;

$\frac{21}{15000}$ of a year $= \frac{21\times365}{15000}$ days,

therefore, fraction $= \frac{7\times73}{1000} = \cdot511$.

5. $\frac{3}{7}$ of $\frac{1}{10}$ of 40 yds. $= \frac{3\times40}{7\times10}$ yds. $= \frac{12}{7}$ yds.;

$\frac{1}{5}$ of 2 miles $= \frac{1760\times2}{5}$ yds. $= (352\times2)$ yds.,

therefore, fraction $= \frac{12}{7\times352\times2} = \frac{3}{7\times88\times2} = \frac{3}{1232} = \cdot00243\ldots\ldots$;

$\frac{1}{4}$ of $3\frac{1}{2}$ sq. yds. $= \left(\frac{1}{4}\times\frac{7}{2}\right)$ sq. yds. $= \frac{7}{8}$ sq. yds.;

2 ac. 1 ro. $= 9$ ro. $= (9\times40\times30\frac{1}{4})$ sq. yds. $= (9\times10\times121)$ sq. yds.,

therefore, fraction $= \frac{7}{8\times9\times10\times121} = \frac{7}{87120} = \cdot000080\ldots\ldots$

6. $\frac{3}{5}$ of $4\frac{4}{9}$ hrs. $= \frac{3\times40}{5\times9}$ hrs. $= \frac{8}{3}$ hrs.;

$365\frac{1}{4}$ days $= \frac{1461\times24}{4}$ hrs. $= (1461\times6)$ hrs.,

therefore, fraction $= \frac{8}{3\times1461\times6} = \frac{4}{13149} = \cdot000304\ldots\ldots$;

$9\frac{6}{11}$ of $\frac{11}{15}$ pks. $= \dfrac{105 \times 11}{11 \times 15}$ pks. $= 7$ pks.;

$3\frac{1}{3}$ qrs. $= \left(\dfrac{10}{3} \times 8 \times 4\right)$ pks. $= \dfrac{320}{3}$ pks.;

therefore, fraction $= \dfrac{21}{320} = \dfrac{2\cdot625}{40} = \cdot065625$.

7. 3 lbs. 6 oz. Troy $= 42$ oz. $= (42 \times 20 \times 24)$ grs.;

10 lbs. Av. $= (10 \times 7000)$ grs.,

therefore, fraction $= \dfrac{42 \times 20 \times 24}{10 \times 7000} = \dfrac{6 \times 20 \times 24}{10000} = \dfrac{2880}{10000} = \cdot288$;

$\frac{1}{5}$ oz. Av. $= \left(\dfrac{1}{5} \times \dfrac{1}{16} \times 7000\right)$ grs. $= \dfrac{175}{2}$ grs.;

$\frac{1}{3}$ oz. Troy $= \left(\dfrac{1}{3} \times 20 \times 24\right)$ grs. $= 160$ grs.;

therefore, fraction $= \dfrac{175}{2 \times 160} = \dfrac{21\cdot875}{40} = \cdot546875$.

(3) $\frac{3}{8}$ of a crown $+ \frac{4}{5}$ of a shilling $= \left(\dfrac{15}{8} + \dfrac{4}{5}\right)s. = \dfrac{107}{40}s.$;

therefore, fraction $= \dfrac{107}{40 \times 7} = \dfrac{2\cdot675}{7} = \cdot382\dot{1}4285\dot{7}$.

(4) $\frac{3}{5}$ of a half-crown $+ \cdot4s. = \left(\dfrac{3}{2} + \dfrac{2}{5}\right)s. = \dfrac{19}{10}s.$;

therefore, fraction $= \dfrac{1\cdot9}{40} = \cdot0475$.

(5) $\frac{3}{5}$ day $+ \frac{2}{3}$ hour $+ \frac{4}{5}$ of 6 hours $= \left(\dfrac{3 \times 24}{5} + \dfrac{2}{3} + \dfrac{24}{5}\right)$ hours $= \dfrac{238}{15}$ hours,

and 1 week $= 7 \times 24$ hours;

therefore, fraction $= \dfrac{238}{15 \times 24 \times 7} = \dfrac{34}{15 \times 24} = \dfrac{17}{180} = \cdot09\dot{4}$.

(6) $\frac{2}{5}$ guinea $- \frac{3}{4}$ of $7s.\ 6d. = \left(\dfrac{42}{5} - \dfrac{45}{8}\right)s. = \dfrac{111}{40}s.$;

therefore, fraction $= \dfrac{111}{27 \times 40} = \dfrac{37}{9 \times 40} = \dfrac{\cdot925}{9} = \cdot102\dot{7}$.

(7) ${\cdot}8\dot{3}$ of 8*s.* + ${\cdot}\dot{0}\dot{5}$ of 2 guineas + 1·8 of 5*s.*

$$=\left(\frac{75\times 8}{90}+\frac{5\times 42}{99}+9\right)s.=\left(\frac{20}{3}+\frac{70}{33}+9\right)s.=\frac{587}{33}s.,$$

and half-a-guinea $=\frac{21}{2}s.$;

therefore, fraction $=\frac{587\times 2}{21\times 33}=\frac{1174}{693}=1{\cdot}694\ldots.$

(8) $6\frac{1}{2}$ half-guineas = £3 3*s.* + 5*s.* 3*d.* = £3 8*s.* 3*d.*,

£3·525 = £3 + 10·5*s.* = £3 10*s.* 6*d.*;

therefore, difference = 2*s.* 3*d.* = 27*d.*,

and a crown = 60*d.*;

therefore, fraction $=\frac{27}{60}=\frac{9}{20}={\cdot}45.$

(9) $5\frac{1}{2}$ cwt. = 22 qrs.,

therefore, 22 qrs. + 3·125 qrs. = 25·125 qrs.;

and a ton = (20 × 4) qrs.,

therefore, fraction $=\frac{25{\cdot}125}{20\times 4}=\frac{2{\cdot}5125}{8}={\cdot}3140625.$

(10) 1.

$$\begin{array}{r|l} 12 & 6{\cdot}0 \\ \cline{2-2} 2,0 & \ \ {\cdot}50 \\ \cline{2-2} & \ \ {\cdot}025 \end{array} \qquad \text{and } \overset{\text{c.}}{2}\ .\ \overset{\text{m.}}{5}=\overset{£.}{{\cdot}025} \qquad \begin{array}{r} 20 \\ \hline {\cdot}500\ s. \\ 12 \\ \hline 6{\cdot}000\ d. \end{array}$$

∴ 6*d.* = 2 c. 5 m

2.

$$\begin{array}{r|l} 12 & 10{\cdot}0 \\ \cline{2-2} 2,0 & \ \ {\cdot}83\dot{3} \\ \cline{2-2} & \ \ {\cdot}041\dot{6} \end{array} \qquad \text{and } \overset{\text{c.}}{4}\ .\ \overset{\text{m.}}{1\tfrac{2}{3}}=\overset{£.}{{\cdot}041\dot{6}} \qquad \begin{array}{r} 20 \\ \hline {\cdot}83\dot{3}\ s. \\ 12 \\ \hline 10{\cdot}000\ d. \end{array}$$

∴ 10*d.* = 4 c. $1\frac{6}{9}$ m. = 4 c. $1\frac{2}{3}$ m.

3.

$$\begin{array}{r|l} 4 & 2{\cdot}0 \\ \cline{2-2} 12 & 4{\cdot}5 \\ \cline{2-2} 2,0 & \ \ {\cdot}375 \\ \cline{2-2} & \ \ {\cdot}01875 \end{array} \qquad \text{and } \overset{\text{c.}}{1}\ .\ \overset{\text{m.}}{8\tfrac{1}{4}}=\overset{£.}{{\cdot}01875} \qquad \begin{array}{r} 20 \\ \hline {\cdot}37500\ s. \\ 12 \\ \hline 4{\cdot}50000\ d. \\ 4 \\ \hline 2{\cdot}00000\ q. \end{array}$$

∴ $4\frac{1}{2}d.$ = 1 c. $8\frac{3}{4}$ m.

4. $$\begin{array}{r|l} 2,0 & 5\cdot0 \\ \hline & \cdot25 \end{array}$$

$$\begin{array}{r} \text{and } \overset{\text{fl.}}{2}\ .\ \overset{\text{c.}}{5}=\overset{\text{£.}}{\cdot25} \\ 20 \\ \hline 5\cdot00\ s. \end{array}$$

∴ 5*s*. = 2 fl. 5 c.

5. $$\begin{array}{r|l} 12 & 6\cdot0 \\ \hline 2,0 & 10\cdot5 \\ \hline & \cdot525 \end{array}$$

$$\begin{array}{r} \text{and } \overset{\text{fl.}}{5}\ .\ \overset{\text{c.}}{2}\ .\ \overset{\text{m.}}{5}=\overset{\text{£.}}{\cdot525} \\ 20 \\ \hline 10\cdot500\ s. \\ 12 \\ \hline 6\cdot000\ d. \end{array}$$

∴ 10*s*. 6*d*. = 5 fl. 2 c. 5 m.

6. $$\begin{array}{r|l} 2,0 & 16\cdot0 \\ \hline & \cdot8 \end{array}$$

$$\begin{array}{r} \text{and } \overset{\text{fl.}}{8}=\overset{\text{£.}}{\cdot8} \\ 20 \\ \hline 16\cdot0\ s. \end{array}$$

∴ 16*s*. = 8 fl.

7. $$\begin{array}{r|l} 12 & 6\cdot0 \\ \hline 2,0 & 12\cdot5 \\ \hline & 5\cdot625 \end{array}$$

$$\begin{array}{r} \text{and } \overset{\text{£.}}{5}\ .\ \overset{\text{f.}}{6}\ .\ \overset{\text{c.}}{2}\ .\ \overset{\text{m.}}{5}=\overset{\text{£.}}{5\cdot625} \\ 20 \\ \hline 12\cdot500\ s. \\ 12 \\ \hline 6\cdot000\ d. \end{array}$$

∴ £5 12*s*. 6*d*. = £5 6 f. 2 c. 5 m.

8. $$\begin{array}{r|l} 12 & 4\cdot0 \\ \hline 2,0 & 7\cdot3\dot{3} \\ \hline & 54\cdot366\dot{6} \end{array}$$

$$\begin{array}{r} \text{and } \overset{\text{£.}}{54}\ .\ \overset{\text{f.}}{3\tfrac{2}{3}}=\overset{\text{£.}}{54\cdot3\dot{6}} \\ 20 \\ \hline 7\cdot\dot{3}\ s. \\ 12 \\ \hline 4\cdot0\ d. \end{array}$$

∴ £54 7*s*. 4*d*. = £54 3⅔ f.

9. $$\begin{array}{r|l} 4 & 2\cdot0 \\ \hline 12 & 7\cdot5 \\ \hline 2,0 & 19\cdot625 \\ \hline & 20\cdot98125 \end{array}$$

$$\begin{array}{r} \text{and } \overset{\text{£.}}{20}\ .\ \overset{\text{f.}}{9}\ .\ \overset{\text{c.}}{8}\ .\ \overset{\text{m.}}{1\tfrac{1}{4}}=\overset{\text{£.}}{20\cdot98125} \\ 20 \\ \hline 19\cdot62500\ s. \\ 12 \\ \hline 7\cdot50000\ d. \\ 4 \\ \hline 2\cdot00000\ q. \end{array}$$

∴ £20 19*s*. 7½*d*. = £20 9 f. 8 c. 1¼ m.

10. $$\begin{array}{r|l} 4 & 3\cdot00 \\ \hline 12 & 4\cdot75 \\ \hline 2,0 & 15\cdot3958\dot{3} \\ \hline & \cdot769791\dot{6} \end{array}$$

$$\begin{array}{r} \text{and } \overset{\text{f.}}{7}\ .\ \overset{\text{c.}}{6}\ .\ \overset{\text{m.}}{9\cdot791\dot{6}}=\overset{\text{£.}}{\cdot769791\dot{6}} \\ 20 \\ \hline 15\cdot39583\dot{3}\ s. \\ 12 \\ \hline 4\cdot750000\ d. \\ 4 \\ \hline 3\cdot000000\ q. \end{array}$$

∴ 15*s*. 4¾*d*. = 7 f. 6 c. $9\cdot791\dot{6}$ m.

11.
$$\begin{array}{r|l} 12 & 8{\cdot}16 \\ \hline 2{,}0 & 14{\cdot}68 \\ \hline & {\cdot}734 \end{array} \qquad \text{and } \overset{\text{f.}}{7}\;.\;\overset{\text{c.}}{3}\;.\;\overset{\text{m.}}{4} = \begin{array}{r} \text{£.} \\ {\cdot}734 \\ 20 \\ \hline 14{\cdot}680\ s. \\ 12 \\ \hline 8{\cdot}160\ d. \end{array}$$

∴ 14*s.* 8·16*d.* = 7 f. 3 c. 4 m.

12.
$$\begin{array}{r|l} 12 & 11{\cdot}088 \\ \hline 2{,}0 & 15{\cdot}924 \\ \hline & 2{\cdot}7962 \end{array} \qquad \text{and } \overset{\text{£.}}{2}\;.\;\overset{\text{f.}}{7}\;.\;\overset{\text{c.}}{9}\;.\;\overset{\text{m.}}{6\frac{1}{5}} = \begin{array}{r} \text{£.} \\ 2{\cdot}7962 \\ 20 \\ \hline 15{\cdot}924\ s. \\ 12 \\ \hline 11{\cdot}088\ d. \end{array}$$

∴ £2 15*s.* 11·088*d.* = £2 7 f. 9 c. $6\frac{1}{5}$ m.

13.
$$\begin{array}{r|l} 4 & 3{\cdot}04 \\ \hline 12 & 11{\cdot}76 \\ \hline 2{,}0 & {\cdot}98 \\ \hline & 3{\cdot}049 \end{array} \qquad \text{and } \overset{\text{£.}}{3}\;.\;\overset{\text{c.}}{4}\;.\;\overset{\text{m.}}{9} = \begin{array}{r} \text{£.} \\ 3{\cdot}049 \\ 20 \\ \hline {\cdot}980\ s. \\ 12 \\ \hline 11{\cdot}760\ d. \\ 4 \\ \hline 3{\cdot}040\ q. \end{array}$$

∴ £3 0*s.* 11*d.* 3·04*q.* = £3 4 c. 9 m.

Ex. LIII. (p. 160.)

1.

	£.	s.	d.	
2*s.* 6*d.* = ⅛ of £1	645	0	0	= value at £1 each.
	£80	12	6	= value at 2*s.* 6*d.* each.

	£.	s.	d.	
10*s.* = ½ of £1	69	0	0	= value at £1 each.
6*d.* = $\frac{1}{20}$ of 10*s.*	34	10	0	= value at 10*s.* each.
	1	14	6	= value at 6*d.* each.
	£36	4	6	= value at 10*s.* 6*d.* each.

2.

	£.	s.	d.	
2*s.* = $\frac{1}{10}$ of £1	454	0	0	= value at £1 each.
6*d.* = ¼ of 2*s.*	45	8	0	= value at 2*s.* each.
3*d.* = ½ of 6*d.*	11	7	0	= value at 6*d.* each.
	5	13	6	= value at 3*d.* each.
	£62	8	6	= value at 2*s.* 9*d.* each.

	£.	s.	d.	
1*s.* = $\frac{1}{20}$ of £1	72	0	0	= value at £1 each.
6*d.* = ½ of 1*s.*	3	12	0	= value at 1*s.* each.
1*d.* = ⅙ of 6*d.*	1	16	0	= value at 6*d.* each.
		6	0	= value at 1*d.* each.
	£5	14	0	= value at 1*s.* 7*d.* each.

		£.	s.	d.	
3.	2*s*. 6*d*. = $\frac{1}{8}$ of £1	52	0	0	= value at £1 each.
	1*s*. 3*d*. = $\frac{1}{2}$ of 2*s*. 6*d*.	6	10	0	= value at 2*s*. 6*d*. each.
		3	5	0	= value at 1*s*. 3*d*. each.
		£9	15	0	= value at 3*s*. 9*d*. each.

		£.	s.	d.	
	6*d*. = $\frac{1}{40}$ of £1	1257	0	0	= value at £1 each
	$\frac{3}{4}$*d*. = $\frac{1}{8}$ of 6*d*.	31	8	6	= value at 6*d*. each.
		3	18	6$\frac{3}{4}$	= value at $\frac{3}{4}$*d*. each.
		£35	7	0$\frac{3}{4}$	= value at 6$\frac{3}{4}$*d*. each.

		£.	s.	d.	
4.	4*s*. = $\frac{1}{5}$ of £1	626	0	0	= value at £1 each.
	4*s*. = $\frac{1}{5}$ of £1	125	4	0	= value at 4*s*. each.
	8*d*. = $\frac{1}{6}$ of 4*s*.	125	4	0	= value at 4*s*. each.
		20	17	4	= value at 8*d*. each.
		£271	5	4	= value at 8*s*. 8*d*. each.

		£.	s.	d.	
	10*s*. = $\frac{1}{2}$ of £1	286	0	0	= value at £1 each.
	2*s*. = $\frac{1}{5}$ of 10*s*.	143	0	0	= value at 10*s*. each.
	1*d*. = $\frac{1}{24}$ of 2*s*.	28	12	0	= value at 2*s*. each.
		1	3	10	= value at 1*d*. each.
		£172	15	10	= value at 12*s*. 1*d*. each.

		£.	s.	d.	
5.	4*s*. = $\frac{1}{5}$ of £1	80	0	0	= value at £1 each.
	4*d*. = $\frac{1}{12}$ of 4*s*.	16	0	0	= value at 4*s*. each.
	$\frac{1}{4}$*d*. = $\frac{1}{16}$ of 4*d*.	1	6	8	= value at 4*d*. each.
			1	8	= value at $\frac{1}{4}$*d*. each.
		£17	8	4	= value at 4*s*. 4$\frac{1}{4}$*d*. each.

		£.	s.	d.	
	4*s*. = $\frac{1}{5}$ of £1.	37	0	0	= value at £1 each.
	1*s*. = $\frac{1}{4}$ of 4*s*.	7	8	0	= value at 4*s*. each.
	4*d*. = $\frac{1}{3}$ of 1*s*.	1	17	0	= value at 1*s*. each.
	1*d*. = $\frac{1}{4}$ of 4*d*.		12	4	= value at 4*d*. each.
	$\frac{1}{2}$*d*. = $\frac{1}{2}$ of 1*d*.		3	1	= value at 1*d*. each.
			1	6$\frac{1}{2}$	= value at $\frac{1}{2}$*d*. each.
		£10	1	11$\frac{1}{2}$	= value at 5*s*. 5$\frac{1}{2}$*d*. each.

		£.	s.	d.	
6.	10*s*. = $\frac{1}{2}$ of £1	138	0	0	= value at £1 each.
	4*s*. = $\frac{1}{5}$ of £1	69	0	0	= value at 10*s*. each.
		27	12	0	= value at 4*s*. each.
		£234	12	0	= value at £1 14*s*. each.

		£.	s.	d.	
	10*s*. = ½ of £1	589	0	0	= value at £1 each.
	1*s*. = 1/10 of 10*s*.	294	10	0	= value at 10*s*. each.
	6*d*. = ½ of 1*s*.	29	9	0	= value at 1*s*. each.
		14	14	6	= value at 6*d*. each.
		£927	13	6	= value at £1 11*s*. 6*d*. each.

		£.	s.	d.	
7.	2*s*. 6*d*. = ⅛ of £1	95	0	0	= value at £1 each.
		11	17	6	= value at 2*s*. 6*d*. each.
		£106	17	6	= value at £1 2*s*. 6*d*. each.

		£.	s.	d.	
	5*s*. = ¼ of £1	107	0	0	= value at £1 each.
				6	
		642	0	0	= value at £6 each.
				4	
		2568	0	0	= value at £24 each.
	1*s*. = ⅕ of 5*s*.	26	15	0	= value at 5*s*. each.
	2*d*. = ⅙ of 1*s*.	5	7	0	= value at 1*s*. each.
			17	10	= value at 2*d*. each.
		£2600	19	10	= value at £24 6*s*. 2*d*. each.

		£.	s.	d.	
8.	4*s*. = ⅕ of £1	457	0	0	= value at £1 each.
	4*s*. = ⅕ of £1	91	8	0	= value at 4*s*. each.
	6*d*. = ⅛ of 4*s*.	91	8	0	= value at 4*s*. each.
		11	8	6	= value at 6*d*. each.
		£651	4	6	= value at £1 8*s*. 6*d*. each.

		£.	s.	d.	
	1*s*. = 1/20 of £1	88	0	0	= value at £1 each.
	1½*d*. = ⅛ of 1*s*.	4	8	0	= value at 1*s*. each.
			11	0	= value at 1½*d*. each.

		£.	s.	d.	
9.	5*s*. = ¼ of £1	111	0	0	= value at £1 each.
				2	
		222	0	0	= value at £2 each.
	10*d*. = ⅙ of 5*s*.	27	15	0	= value at 5*s*. each.
		4	12	6	= value at 10*d*. each.
		£254	7	6	= value at £2 5*s*. 10*d*. each.

		£.	s.	d.	
	10*s*. = ½ of £1	9251	0	0	= value at £1 each.
	4*s*. = ⅕ of £1	4625	10	0	= value at 10*s*. each.
	8*d*. = ⅙ of 4*s*.	1850	4	0	= value at 4*s*. each.
	2*d*. = ¼ of 8*d*.	308	7	4	= value at 8*d*. each.
	1*d*. = ½ of 2*d*.	77	1	10	= value at 2*d*. each.
		38	10	11	= value at 1*d*. each.
		£6899	14	1	= value at 14*s*. 11*d*. each.

			s.	*d.*	
10.	6*d*. = ½ of 1*s*.		4681 .	0	= value at 1*s*. each.
	2*d*. = ⅓ of 6*d*.		2340 .	6	= value at 6*d*. each.
	¾*d*. = ⅛ of 6*d*.		780 .	2	= value at 2*d*. each.
			292 .	6¾	= value at ¾*d*. each.
		2,0	341,3 .	2¾	
			£170 . 13 .	2¾	= value at 8¾*d*. each.

	£.	*s.*	*d.*	
10*s*. = ½ of £1	1209 .	0 .	0	= value at £1 each.
2*s*. 6*d*. = ¼ of 10*s*.	604 .	10 .	0	= value at 10*s*. each.
6*d*. = ⅕ of 2*s*. 6*d*.	151 .	2 .	6	= value at 2*s*. 6*d*. each.
1*d*. = ⅙ of 6*d*.	30 .	4 .	6	= value at 6*d*. each.
	5 .	0 .	9	= value at 1*d*. each.
	£790 .	17 .	9	= value at 13*s*. 1*d*. each.

		£.	*s.*	*d.*	
11.	5*s*. = ¼ of £1	1450 .	0 .	0	= value at £1 each.
	2*s*. = $\frac{1}{10}$ of £1	362 .	10 .	0	= value at 5*s*. each.
	8*d*. = ⅓ of 2*s*.	145 .	0 .	0	= value at 2*s*. each.
		48 .	6 .	8	= value at 8*d*. each.
		£2005 .	16 .	8	= value at £1 7*s*. 8*d*. each.

	£.	*s.*	*d.*	
10*s*. = ½ of £1	249 .	0 .	0	= value at £1 each.
			2	
	498 .	0 .	0	= value at £2 each.
2*s*. 6*d*. = ¼ of 10*s*.	124 .	10 .	0	= value at 10*s*. each.
1*s*. 3*d*. = ½ of 2*s*. 6*d*.	31 .	2 .	6	= value at 2*s*. 6*d*. each.
	15 .	11 .	3	= value at 1*s*. 3*d*. each.
	£669 .	3 .	9	= value at £2 13*s*. 9*d*. each.

		£.	*s.*	*d.*	
12.	10*s*. = ½ of £1	898 .	0 .	0	= value at £1 each.
	4*s*. = ⅕ of £1	449 .	0 .	0	= value at 10*s*. each.
	4*s*. = ⅕ of £1	179 .	12 .	0	= value at 4*s*. each.
	6*d*. = ⅛ of 4*s*.	179 .	12 .	0	= value at 4*s*. each.
	1*d*. = ⅙ of 6*d*.	22 .	9 .	0	= value at 6*d*. each.
	¾*d*. = ⅛ of 6*d*.	3 .	14 .	10	= value at 1*d*. each.
		2 .	16 .	1½	= value at ¾*d*. each.
		£837 .	3 .	11½	= value at 18*s*. 7¾*d*. each.

	£.	*s.*	*d.*	
10*s*. = ½ of £1	405 .	0 .	0	= value at £1 each.
5*s*. = ½ of 10*s*.	202 .	10 .	0	= value at 10*s*. each.
4*s*. = ⅕ of £1	101 .	5 .	0	= value at 5*s*. each.
8*d*. = ⅙ of 4*s*.	81 .	0 .	0	= value at 4*s*. each.
¼*d*. = $\frac{1}{32}$ of 8*d*.	13 .	10 .	0	= value at 8*d*. each.
		8 .	5¼	= value at ¼*d*. each.
	£398 .	13 .	5¼	= value at 19*s*. 8¼*d*. each.

		£	s.	d.	
13.	1s. = $\frac{1}{20}$ of £1	744	0	0	= value at £1 each.
				20	
		14880	0	0	= value at £20 each.
	subtracting	37	4	0	= value at 1s. each.
		£14842	16	0	= value at £19 19s. each.

		£.	s.	d.	
	2s. = $\frac{1}{10}$ of £1	421	0	0	= value at £1 each.
				4	
		1684	0	0	= value at £4 each.
	6d. = $\frac{1}{4}$ of 2s.	42	2	0	= value at 2s. each.
	¾d. = $\frac{1}{8}$ of 6d.	10	10	6	= value at 6d. each.
		1	6	3¾	= value at ¾d. each.
		£1737	18	9¾	= value at £4 2s. 6¾d. each.

		s.	d.	
14.	½d. = $\frac{1}{24}$ of 1s.	1593	0	= value at 1s. each.
			9	
		14337	0	= value at 9s. each.
		66	4½	= value at ½d. each.
	2,0	1440,3	4½	
		£720 . 3	4½	= value at 9s. 0½d. each.

		s.	d.	
	1d. = $\frac{1}{12}$ of 1s.	6602	0	= value at 1s. each.
			7	
		46214	0	= value at 7s. each.
	½d. = $\frac{1}{2}$ of 1d.	550	2	= value at 1d. each.
	¼d. = $\frac{1}{2}$ of ½d.	275	1	= value at ½d. each.
		137	6½	= value at ¼d. each.
	2,0	4717,6	9½	
		£2358 . 16	9½	= value at 7s. 1¾d. each.

		£.	s.	d.	
15.	10s. = $\frac{1}{2}$ of £1	7382	0	0	= value at £1 each.
				3	
		22146	0	0	= value at £3 each.
	5s. = $\frac{1}{2}$ of 10s.	3691	0	0	= value at 10s. each.
	4d. = $\frac{1}{15}$ of 5s.	1845	10	0	= value at 5s. each.
	½d. = $\frac{1}{8}$ of 4d.	123	0	8	= value at 4d. each.
		15	7	7	= value at ½d. each.
		£27820	18	3	= value at £3 15s. 4½d. each.

		£.	s.	d.	
	10s. = $\frac{1}{2}$ of £1	5614	0	0	= value at £1 each.
				14	
		78596	0	0	= value at £14 each.
	4s. = $\frac{1}{5}$ of £1	2807	0	0	= value at 10s. each.
	4d. = $\frac{1}{12}$ of 4s.	1122	16	0	= value at 4s. each.
	1d. = $\frac{1}{4}$ of 4d.	93	11	4	= value at 4d. each.
	½d. = $\frac{1}{2}$ of 1d.	23	7	10	= value at 1d. each.
		11	3	11	= value at ½d. each.
		£82654	9	1	= value at £14 14s. 5½d. each.

		£.	s.	d.	
16.	10*s*. = $\frac{1}{2}$ of £1	6573	0	0	= value at £1 each.
				5	
		32865	0	0	= value at £5 each.
	5*s*. = $\frac{1}{2}$ of 10*s*.	3286	10	0	= value at 10*s*. each.
	2*s*. 6*d*. = $\frac{1}{2}$ of 5*s*.	1643	5	0	= value at 5*s*. each.
	1*s*. = $\frac{1}{5}$ of 5*s*.	821	12	6	= value at 2*s*. 6*d*. each.
	4*d*. = $\frac{1}{3}$ of 1*s*.	328	13	0	= value at 1*s*. each.
	¼*d*. = $\frac{1}{16}$ of 4*d*.	109	11	0	= value at 4*d*. each.
		6	16	11¼	= value at ¼*d*. each.
		£39061	8	5¼	= value at £5 18*s*. 10¼*d*. each.

	£.	s.	d.	
10*s*. = $\frac{1}{2}$ of £1	37271	0	0	= value at £1 each.
			6	
	223626	0	0	= value at £6 each.
2*s*. 6*d*. = $\frac{1}{4}$ of 10*s*.	18635	10	0	= value at 10*s*. each.
6*d*. = $\frac{1}{5}$ of 2*s*. 6*d*.	4658	17	6	= value at 2*s*. 6*d*. each.
¾*d*. = $\frac{1}{8}$ of 6*d*.	931	15	6	= value at 6*d*. each.
	116	9	5¼	= value at ¾*d*. each.
	£247968	12	5¼	= value at £6 13*s*. 0¾*d*. each.

		£.	s.	d.	
17.	10*s*. = $\frac{1}{2}$ of £1	51143	0	0	= value at £1 each.
				4	
		204572	0	0	= value at £4 each.
	5*s*. = $\frac{1}{2}$ of 10*s*.	25571	10	0	= value at 10*s*. each.
	2*s*. 6*d*. = $\frac{1}{2}$ of 5*s*.	12785	15	0	= value at 5*s*. each.
	3*d*. = $\frac{1}{10}$ of 2*s*. 6*d*.	6392	17	6	= value at 2*s*. 6*d*. each.
	¼*d*. = $\frac{1}{12}$ of 3*d*.	639	5	9	= value at 3*d*. each.
		53	5	5¾	= value at ¼*d*. each.
		£250014	13	8¾	= value at £4 17*s*. 9¼*d*. each.

	£	s.	d.	
10*d*. = $\frac{1}{24}$ of £1	6293	0	0	= value at £1 each.
			7	
	44051	0	0	= value at £7 each.
1*d*. = $\frac{1}{10}$ of 10*d*.	262	4	2	= value at 10*d*. each.
½*d*. = $\frac{1}{2}$ of 1*d*.	26	4	5	= value at 1*d*. each.
¼*d*. = $\frac{1}{2}$ of ½*d*.	13	2	2½	= value at ½*d*. each.
	6	11	1¼	= value at ¼*d*. each.
	£44359	1	10¾	= value at £7 0*s*. 11¾*d*. each.

		£.	s.	d.	
18.	10*s*. = $\frac{1}{2}$ of £1	3027	0	0	= value at £1 each.
				5	
		15135	0	0	= value at £5 each.
	2*s*. = $\frac{1}{5}$ of 10*s*.	1513	10	0	= value at 10*s*. each.
	2*d*. = $\frac{1}{12}$ of 2*s*.	302	14	0	= value at 2*s*. each.
	½*d*. = $\frac{1}{4}$ of 2*d*.	25	4	6	= value at 2*d*. each.
		6	6	1½	= value at ½*d*. each.
		£16982	14	7½	= value at £5 12*s*. 2½*d*. each.

	£.	s.	d.	
1*d*. = $\frac{1}{240}$ of £1	4945	0	0	= value at £1 each.
½*d*. = ½ of 1*d*.	20	12	1	= value at 1*d*. each.
¼*d*. = ½ of ½*d*.	10	6	0½	= value at ½*d*. each.
	5	3	0¼	= value at ¼*d*. each.
	£4981	1	1¾	= value at £1 0*s*. 1¾*d*. each.

19.

	£.	s.	d.	
5*s*. = ¼ of £1	733	0	0	= value at £1 each.
4*s*. = ⅕ of £1	183	5	0	= value at 5*s*. each.
4*d*. = $\frac{1}{12}$ of 4*s*.	146	12	0	= value at 4*s*. each.
	12	4	4	= value at 4*d*. each.
	1075	1	4	= value at £1 9*s*. 4*d*. each.
¼ of £1 9*s*. 4*d*. =		7	4	
	£1075	8	8	= value of 733¼.

	£.	s.	d.	
10*s*. = ½ of £1	751	0	0	= value at £1 each.
			2	
	1502	0	0	= value at £2 each.
5*s*. = ½ of 10*s*.	375	10	0	= value at 10*s*. each.
2*s*. 6*d*. = ½ of 5*s*.	187	15	0	= value at 5*s*. each.
3*d*. = $\frac{1}{10}$ of 2*s*. 6*d*.	93	17	0	= value at 2*s*. 6*d*. each.
1*d*. = ⅓ of 3*d*.	9	7	9	= value at 3*d*. each.
	3	2	7	= value at 1*d*. each.
	2171	12	10	= value at £2 17*s*. 10*d*. each.
½ of £2 17*s*. 10*d*. =	1	8	11	
	£2173	1	9	= value of 751½.

20.

		s.	d.	
6*d*. = ½ of 1*s*.		1418	0	= value at 1*s*. each.
			7	
		9926	0	= value at 7*s*. each.
3*d*. = ½ of 6*d*.		709	0	= value at 6*d*. each.
½*d*. = ⅙ of 3*d*.		354	6	= value at 3*d*. each.
		59	1	= value at ½*d*. each.
	2,0)	11048	7	
	£552	8	7	= value at 7*s*. 9½*d*. each.
¾ of 7*s*. 9½*d*. =		5	10 − ½*q*.	
	£552	14	5 − ½*q*.	= value of 1418¾.

	£.	s.	d.	
10*s*. = ½ of £1	1178	0	0	= value at £1 each.
5*s*. = ½ of 10*s*.	589	0	0	= value at 10*s*. each.
1*s*. 8*d*. = ⅓ of 5*s*.	294	10	0	= value at 5*s*. each.
	98	3	4	= value at 1*s*. 8*d*. each.
	981	13	4	= value at 16*s*. 8*d*. each.
⅜ of 16*s*. 8*d*. =		6	3	
	£981	19	7	= value of 1178⅜.

21.

	£.	s.	d.	
1s. = $\frac{1}{20}$ of £1	1762	0	0	= value at £1 each.
6d. = $\frac{1}{2}$ of 1s.	88	2	0	= value at 1s. each.
4d. = $\frac{1}{3}$ of 1s.	44	1	0	= value at 6d. each.
$\frac{1}{2}$d. = $\frac{1}{8}$ of 4d.	29	7	4	= value at 4d. each.
	3	13	5	= value at $\frac{1}{2}$d. each.
	1927	3	9	= value at £1 1s. 10$\frac{1}{2}$d. each.
$\frac{3}{5}$ of £1 1s. 10$\frac{1}{2}$d =		13	1$\frac{1}{2}$	
	£1927	16	10$\frac{1}{2}$	= value of 1762$\frac{3}{5}$.

	s.	d.	
6d. = $\frac{1}{2}$ of 1s.	5555	0	= value at 1s. each.
		6	
	33330	0	= value at 6s. each.
4d. = $\frac{1}{3}$ of 1s.	2777	6	= value at 6d. each.
$\frac{1}{4}$d. = $\frac{1}{16}$ of 4d.	1851	8	= value at 4d. each.
	115	8$\frac{3}{4}$	= value at $\frac{1}{4}$d. each.
2,0	3807,4	10$\frac{3}{4}$	
	1903 . 14	10$\frac{3}{4}$	= value at 6s. 10$\frac{1}{4}$d. each.
$\frac{5}{9}$ of 6s. 10$\frac{1}{4}$d. =	3	9$\frac{25}{36}$	
	£1903 . 18	8$\frac{1}{4}$. $\frac{7}{9}$q.	= value of 5555$\frac{5}{9}$.

22.

	£.	s.	d.	
10s. = $\frac{1}{2}$ of £1	4013	0	0	= value at £1 each.
			2	
	8026	0	0	= value at £2 each.
5s. = $\frac{1}{2}$ of 10s.	2006	10	0	= value at 10s. each.
1s. = $\frac{1}{5}$ of 5s.	1003	5	0	= value at 5s. each.
6d. = $\frac{1}{2}$ of 1s.	200	13	0	= value at 1s. each.
$\frac{1}{4}$d. = $\frac{1}{24}$ of 6d.	100	6	6	= value at 6d. each.
	4	3	7$\frac{1}{4}$	= value at $\frac{1}{4}$d. each.
	11340	18	1$\frac{1}{4}$	= value at £2 16s. 6$\frac{1}{4}$d.
$\frac{5}{8}$ of £2 16s. 6$\frac{1}{4}$d. =	1	15	3$\frac{3}{4}$. $\frac{5}{8}$q.	
	£11342	13	5 − $\frac{5}{8}$q.	= value of 4013$\frac{5}{8}$ at £2 16s. 6$\frac{1}{4}$d. each.

	£.	s.	d.	
10s. = $\frac{1}{2}$ of £1	6005	0	0	= value at £1 each.
5s. = $\frac{1}{2}$ of 10s.	3002	10	0	= value at 10s. each.
2s. 6d. = $\frac{1}{2}$ of 5s.	1501	5	0	= value at 5s. each.
6d. = $\frac{1}{5}$ of 2s. 6d.	750	12	6	= value at 2s. 6d. each.
3d. = $\frac{1}{2}$ of 6d.	150	2	6	= value at 6d. each.
$\frac{3}{4}$d. = $\frac{1}{4}$ of 3d.	75	1	3	= value at 3d. each.
	18	15	3$\frac{3}{4}$	= value at $\frac{3}{4}$d. each.
	5498	6	6$\frac{3}{8}$	= value at 18s. 3$\frac{3}{4}$d. each.
$\frac{2}{11}$ of 18s. 3$\frac{3}{4}$d. =		3	3$\frac{3}{4}$. $\frac{9}{11}$q.	
	£5498	9	10$\frac{1}{2}$. $\frac{9}{11}$q.	= value of 6005$\frac{2}{11}$ at 18s. 3$\frac{3}{4}$d. each.

23.

	£.	s.	d.	
10s. = $\frac{1}{2}$ of £1	6444	0	0	= value at £1 each.
			10	
	64440	0	0	= value at £10 each.
4s. = $\frac{1}{5}$ of £1	3222	0	0	= value at 10s. each.
8d. = $\frac{1}{6}$ of 4s.	1288	16	0	= value at 4s. each.
2d. = $\frac{1}{4}$ of 8d.	214	16	0	= value at 8d. each.
$\frac{1}{2}$d. = $\frac{1}{4}$ of 2d.	53	14	0	= value at 2d. each.
	13	8	6	= value at $\frac{1}{2}$d. each.
	69232	14	6	= value at £10 14s. 10$\frac{1}{2}$d. each.
$\frac{13}{16}$ of £10 14s. 10$\frac{1}{2}$d. =	8	14	7$\frac{1}{32}$d.	
	£69241	9	1$\frac{1}{32}$d.	= value of 6444$\frac{13}{16}$.

	£.	s.	d.	
10s. = $\frac{1}{2}$ of £1	5109	0	0	= value at £1 each.
			4	
	20436	0	0	= value at £4 each.
5s. = $\frac{1}{2}$ of 10s.	2554	10	0	= value at 10s. each.
1s. = $\frac{1}{5}$ of 5s.	1277	5	0	= value at 5s. each.
4d. = $\frac{1}{3}$ of 1s.	255	9	0	= value at 1s. each.
$\frac{1}{4}$d. = $\frac{1}{16}$ of 4d.	85	3	0	= value at 4d. each.
	5	6	5$\frac{1}{4}$	= value at $\frac{1}{4}$d. each.
	24613	13	5$\frac{1}{4}$	= value at £4 16s. 4$\frac{1}{4}$d. each.
$\frac{9}{13}$ of £4 16s. 4$\frac{1}{4}$d. =	3	6	8$\frac{1}{4}$. $\frac{12}{13}$q.	
	£24617	0	1$\frac{1}{2}$. $\frac{12}{13}$q.	= value of 5109$\frac{9}{13}$.

24.

$$43{\cdot}35 = 43\tfrac{35}{100} = 43\tfrac{7}{20}.$$

	s.	d.	
6d. = $\frac{1}{2}$ of 1s.	43	0	= value at 1s. each.
		8	
	344	0	= value at 8s. each.
4d. = $\frac{1}{3}$ of 1s.	21	6	= value at 6d. each.
1d. = $\frac{1}{4}$ of 4d.	14	4	= value at 4d. each.
$\frac{1}{4}$d. = $\frac{1}{4}$ of 1d.	3	7	= value at 1d. each.
		10$\frac{3}{4}$	= value at $\frac{1}{4}$d. each.
2,0	38,4	3$\frac{3}{4}$	
	19 . 4	3$\frac{3}{4}$	= value at 8s. 11$\frac{1}{4}$d. each.
$\frac{7}{20}$ of 8s. 11$\frac{1}{4}$d. =	3	1$\frac{1}{2}$. $\frac{3}{20}$q.	
	£19 . 7	5$\frac{1}{4}$. $\frac{3}{20}$q.	= value of 43·35 at 8s. 11$\frac{1}{4}$d. each.

$$147{\cdot}625 = 147\tfrac{625}{1000} = 147\tfrac{5}{8}.$$

	£.	s.	d.	
10s. = $\frac{1}{2}$ of £1	147	0	0	= value at £1 each.
5s. = $\frac{1}{2}$ of 10s.	73	10	0	= value at 10s. each.
4s. = $\frac{1}{5}$ of £1	36	15	0	= value at 5s. each.
6d. = $\frac{1}{8}$ of 4s.	29	8	0	= value at 4s. each.
1d. = $\frac{1}{6}$ of 6d.	3	13	6	= value at 6d. each.
$\frac{1}{4}$d. = $\frac{1}{4}$ of 1d.		12	3	= value at 1d. each.
		3	0$\frac{3}{4}$	= value at $\frac{1}{4}$d. each.
	144	1	9$\frac{3}{4}$	= value at 19s. 7$\frac{1}{4}$d. each.
$\frac{5}{8}$ of 19s. 7$\frac{1}{4}$d. =		12	3 . $\frac{1}{8}$q.	
	£144	14	0$\frac{3}{4}$. $\frac{1}{8}$q.	= value of 147·625.

				s.	d.	
25.	6*d*. = $\frac{1}{2}$ of 1*s*.			1430	0	= value at 1*s*. each.
	2*d*. = $\frac{1}{3}$ of 6*d*.			715	0	= value at 6*d*. each.
	$\frac{2}{3}$*d*. = $\frac{1}{3}$ of 2*d*.			238	4	= value at 2*d*. each.
				79	5$\frac{1}{4}$. $\frac{1}{3}$*q*.	= value at $\frac{2}{3}$*d*. each.
		2,0		103,2	9$\frac{1}{4}$. $\frac{1}{3}$*q*.	
			£51	12	9$\frac{1}{4}$. $\frac{1}{3}$*q*.	= value at 8$\frac{2}{3}$*d*. each.

				s.	d.	
	6*d*. = $\frac{1}{2}$ of 1*s*.			7866	0	= value at 1*s*. each.
					2	
				15732	0	= value at 2*s*. each.
	$\frac{1}{9}$*d*. = $\frac{1}{54}$ of 6*d*.			3933	0	= value at 6*d*. each.
				72	10	= value at $\frac{1}{9}$*d*. each.
		2,0		1973,7	10	
			£986	17	10	= value at 2*s*. 6$\frac{1}{9}$*d*. each.

		£.	s.	d.	
26.	4*s*. = $\frac{1}{5}$ of £1	7400	0	0	= value at £1 each.
	6*d*. = $\frac{1}{8}$ of 4*s*.	1480	0	0	= value at 4*s*. each.
	3*d*. = $\frac{1}{2}$ of 6*d*.	185	0	0	= value at 6*d*. each.
	$\frac{7}{12}$*d*. = $\frac{7}{36}$ of 3*d*.	92	10	0	= value at 3*d*. each.
		17	19	8$\frac{1}{2}$. $\frac{2}{3}$*q*.	= value at $\frac{7}{12}$*d*. each.
		£1775	9	8$\frac{1}{2}$. $\frac{2}{3}$*q*.	= value at 4*s*. 9$\frac{7}{12}$*d*. each.

		£.	s.	d.	
	5*s*. = $\frac{1}{4}$ of £1	2841	0	0	= value at £1 each.
	10*d*. = $\frac{1}{6}$ of 5*s*.	710	5	0	= value at 5*s*. each.
	$\frac{3}{14}$*d*. = $\frac{3}{140}$ of 10*d*.	118	7	6	= value at 10*d*. each.
		2	10	8$\frac{3}{4}$. $\frac{1}{7}$*q*.	= value at $\frac{3}{14}$*d*. each.
		£831	3	2$\frac{3}{4}$. $\frac{1}{7}$*q*.	= value at 5*s*. 10$\frac{3}{14}$*d*. each.

		£.	s.	d.	
27.	10*s*. = $\frac{1}{2}$ of £1	6352	0	0	= value at £1 each.
	2*s*. 6*d*. = $\frac{1}{4}$ of 10*s*.	3176	0	0	= value at 10*s*. each.
	1*s*. = $\frac{1}{10}$ of 10*s*.	794	0	0	= value at 2*s*. 6*d*. each.
	1*d*. = $\frac{1}{12}$ of 1*s*.	317	12	0	= value at 1*s*. each.
	$\frac{9}{10}$*d*. = $\frac{9}{10}$ of 1*d*.	26	9	4	= value at 1*d*. each.
		23	16	4$\frac{3}{4}$. $\frac{1}{5}$*q*.	= value at $\frac{9}{10}$*d*. each.
		£10689	17	8$\frac{3}{4}$. $\frac{1}{5}$*q*.	= val. at £1 13*s*. 7*d*$\frac{9}{10}$. each.

		£.	s.	s.	
		2731	0	0	= value at £1 each.
				4	
	8*s*. = $\frac{1}{10}$ of £4	10924	0	0	= value at £4 each.
	6*d*. = $\frac{1}{16}$ of 8*s*.	1092	8	0	= value at 8*s*. each.
	3*d*. = $\frac{1}{2}$ of 6*d*.	68	5	6	= value at 6*d*. each.
	$\frac{2}{3}$*d*. = $\frac{2}{9}$ of 3*d*.	34	2	9	= value at 3*d*. each.
		7	11	8$\frac{1}{2}$. $\frac{2}{3}$*q*.	= value at $\frac{2}{3}$*d*. each.
		£12126	7	11$\frac{1}{2}$. $\frac{2}{3}$*q*.	= value at £4 8*s*. 9$\frac{2}{3}$*d*. each.

		£.	s.	d.	
28.	2 qrs. = $\frac{1}{2}$ cwt.	2	5	6	= value of 1 cwt.
				5	
		11	7	6	= value of 5 cwt.
	14 lbs. = $\frac{1}{4}$ of 2 qrs.	1	2	9	= value of 2 qrs.
			5	$8\frac{1}{4}$	= value of 14 lbs.
		£12	15	$11\frac{1}{4}$	= value of 5 cwt. 2 qrs. 14 lbs.

		£.	s.	d.	
29.	2 qrs. = $\frac{1}{2}$ cwt.	6	7	8	= value of 1 cwt.
				3	
		19	3	0	= value of 3 cwt.
				11	
		210	13	0	= value of 33 cwt.
	1 qr. = $\frac{1}{2}$ of 2 qrs.	3	3	10	= value of 2 qrs.
	7 lbs. = $\frac{1}{4}$ of 1 qr.	1	11	11	= value of 1 qr.
			7	$11\frac{3}{4}$	= value of 7 lbs.
		£215	16	$8\frac{3}{4}$	= value of 33 cwt. 3 qrs. 7 lbs.

		£.	s.	d.	
30.	2 qrs. = $\frac{1}{2}$ cwt.	1	4	6	= value of 1 cwt.
				8	
		9	16	0	= value of 8 cwt.
				9	
		88	4	0	= value of 72 cwt.
	1 qr. = $\frac{1}{2}$ of 2 qrs.		12	3	= value of 2 qrs.
	14 lbs. = $\frac{1}{2}$ of 1 qr.		6	$1\frac{1}{2}$	= value of 1 qr.
	2 lbs. = $\frac{1}{7}$ of 14 lbs.		3	$0\frac{3}{4}$	= value of 14 lbs.
	1 lb. = $\frac{1}{2}$ of 2 lbs.			$5\frac{1}{4}$	= value of 2 lbs.
				$2\frac{1}{2}.\frac{1}{2}q.$	= value of 1 lb.
		£89	6	$1-\frac{1}{2}q.$	= value of 72 cwt. 3 qrs. 17 lbs.

		£.	s.	d.	
31.	2 qrs. = $\frac{1}{2}$ cwt.	7	13	6	= value of 1 cwt.
				6	
		46	1	0	= value of 6 cwt.
				10	
		460	10	0	= value of 60 cwt.
	1 qr. = $\frac{1}{2}$ of 2 qrs.	3	16	9	= value of 2 qrs.
	7 lbs. = $\frac{1}{4}$ of 1 qr.	1	18	$4\frac{1}{2}$	= value of 1 qr.
	4 lbs. = $\frac{1}{7}$ of 1 qr.		9	$7\frac{1}{8}$	= value of 7 lbs.
	1 lb. = $\frac{1}{4}$ of 4 lbs.		5	$5\frac{11}{14}$	= value of 4 lbs.
			1	$4\frac{25}{56}$	= value of 1 lb.
	.	£467	1	$6\frac{3}{4}d.\frac{3}{7}q.$	= val. of 60 cwt. 3 qrs. 12 lbs.

		£.	s.	d.	
32.	2 qrs. = $\frac{1}{2}$ cwt.	3	7	6	= value of 1 cwt.
				3	
		10	2	6	= value of 3 cwt.
	14 lbs. = $\frac{1}{4}$ of 2 qrs.	1	13	9	= value of 2 qrs.
	2 lbs. = $\frac{1}{7}$ of 14 lbs.		8	$5\frac{1}{4}$	= value of 14 lbs.
			1	$2\frac{1}{4}.\frac{6}{7}q.$	= value of 2 lbs.
		£12	5	$10\frac{1}{2}.\frac{6}{7}q.$	= value of 3 cwt. 2 qrs. 16 lbs.

		£.	s.	d.	
33.	1 ft. = $\frac{1}{3}$ of 1 yard	0 .	5 .	$7\frac{1}{2}$	= value of 1 yard.
				9	
		2 .	10 .	$7\frac{1}{2}$	= value of 9 yards.
	1 ft. = $\frac{1}{3}$ of 1 yard.		1 .	$10\frac{1}{2}$	= value of 1 foot.
	6 in. = $\frac{1}{2}$ of 1 foot.		1 .	$10\frac{1}{2}$	= value of 1 foot.
	4 in. = $\frac{1}{3}$ of 1 foot.			$11\frac{1}{4}$	= value of 6 inches.
				$7\frac{1}{2}$	= value of 4 inches.
		£2 .	15 .	$11\frac{1}{4}$	= value of 9 yds. 2 ft. 10 in.

		£.	s.	d.	
34.	8 lbs. = $\frac{1}{14}$ of a cwt.	3 .	15 .	$7\frac{3}{4}$	= value of 1 cwt.
				4	
		15 .	2 .	7	= value of 4 cwt.
				10	
		151 .	5 .	10	= value of 40 cwt.
	subtracting	3 .	15 .	$7\frac{3}{4}$	= value of 1 cwt.
		147 .	10 .	$2\frac{1}{4}$	= value of 39 cwt.
	2 lbs. = $\frac{1}{4}$ of 8 lbs.		5 .	$4\frac{47}{56}d.$	= value of 8 lbs.
			1 .	$4\frac{47}{224}d.$	= value of 2 lbs.
		£147 .	16 .	$11\frac{1}{4} . \frac{11}{56}q.$	= value of 39 cwt. 10 lbs.

		£.	s.	d.	
35.	14 lbs. = $\frac{1}{2}$ of 1 qr.	1 .	17 .	$8\frac{1}{4}$	= cost of 1 qr.
				12	
		22 .	12 .	3	= cost of 12 qrs.
				10	
		226 .	2 .	6	= cost of 120 qrs. or 30 cwt.
		3 .	15 .	$4\frac{1}{2}$	= cost of 2 qrs.
		229 .	17 .	$10\frac{1}{2}$	= cost of 30 cwt. 2 qrs.
			18 .	$10\frac{1}{8}$	= cost of 14 lbs.
		£230 .	16 .	$8\frac{1}{2} . \frac{1}{2}q.$	= cost of 30 cwt. 2 qrs. 14 lbs.

		£.	s.	d.	
36.	5 dwts. = $\frac{1}{4}$ of 1 oz.	0 .	5 .	10	= value of 1 oz.
				3	
		0 .	17 .	6	= value of 3 oz.
				5	
		4 .	7 .	6	= value of 15 oz.
	1 dwt. = $\frac{1}{5}$ of 5 dwts.		1 .	$5\frac{1}{2}$	= value of 5 dwts.
	12 grs. = $\frac{1}{2}$ of 1 dwt.			$3\frac{1}{2}$	= value of 1 dwt.
	4 grs. = $\frac{1}{3}$ of 12 grs.			$1\frac{3}{4}$	= value of 12 grs.
	1 gr. = $\frac{1}{4}$ of 4 grs.			$\frac{7}{12}$	= value of 4 grs.
				$\frac{7}{48}$	= value of 1 gr.
		£4 .	9 .	$5\frac{1}{4} . \frac{11}{12}q.$	= val. of 15 oz. 6 dwts. 17 grs.

		£.	s.	d.	
37.	2 roods = $\frac{1}{2}$ of 1 acre	2	12	6	= rent of 1 acre.
				2	
		5	5	0	= rent of 2 acres.
				10	
		52	10	0	= rent of 20 acres.
		7	17	6	= rent of 3 acres.
		60	7	6	= rent of 23 acres.
	1 rood = $\frac{1}{2}$ of 2 roods	1	6	3	= rent of 2 roods.
	5 poles = $\frac{1}{8}$ of 1 rood		13	$1\frac{1}{2}$	= rent of 1 rood.
			1	$7\frac{1}{2} \cdot \frac{3}{4}q.$	= rent of 5 poles.
		£62	8	$6 - \frac{3}{4}q.$	= rent of 23 ac. 3 ro. 5 po.

		£.	s.	d.	
38.	1 qr. = $\frac{1}{4}$ of 1 cwt.	2	0	7	= value of 1 cwt.
				7	
		14	4	1	= value of 7 cwt.
	14 lbs. = $\frac{1}{2}$ of 1 qr.		10	$1\frac{3}{4}$	= value of 1 qr.
	1 lb. = $\frac{1}{14}$ of 14 lbs.		5	$0\frac{7}{8}$	= value of 14 lbs.
	$\frac{1}{2}$ lb. = $\frac{1}{2}$ of 1 lb.			$4\frac{39}{112}$	= value of 1 lb.
				$2\frac{39}{224}$	= value of $\frac{1}{2}$ lb.
		£14	19	$10\frac{33}{224}d.$	= value of 7 cwt. 1 qr. $15\frac{1}{2}$ lbs.

		£.	s.	d.	
39.	10 poles = $\frac{1}{4}$ of 1 rood	0	13	$10\frac{1}{2}$	= rent of 1 rood.
				10	
		6	12	1	= rent of 10 roods.
				10	
		66	0	10	= rent of 100 roods.
				9	
		594	7	6	= rent of 900 roods.
			13	$2\frac{1}{2}$	= rent of 1 rood.
		595	0	$8\frac{1}{2}$	= rent of 901 ro. or 225 ac. 1 ro.
	8 poles = $\frac{1}{5}$ of 1 rood		3	$3\frac{5}{8}$	= rent of 10 poles.
	1 pole = $\frac{1}{8}$ of 8 poles		2	$7\frac{7}{10}$	= rent of 8 poles.
				$3\frac{77}{80}$	= rent of 1 pole.
		£595	6	$11\frac{3}{4} \cdot \frac{3}{20}q.$	= rent of 225 ac. 1 ro. 19 po.

		£.	s.	d.	
40.	2 pecks = $\frac{1}{2}$ of 1 bush.	0	5	$8\frac{1}{4}$	= cost of 1 bushel.
				10	
		2	16	$10\frac{1}{2}$	= cost of 10 bushels.
				9	
		25	11	$10\frac{1}{2}$	= cost of 90 bushels.
				2	
		51	3	9	= cost of 180 bus. or 22 qrs. 4 bus.
	1 peck = $\frac{1}{2}$ of 2 pecks		2	$10\frac{1}{8}$	= cost of 2 pecks.
			1	$5\frac{1}{16}$	= cost of 1 peck.
		£51	8	$0\frac{3}{16}$	= cost of 22 qrs. 4 bus. 3 pks.

		£.	s.	d.	
41.	14 lbs. = $\frac{1}{8}$ of 1 cwt.	5	11	$7\frac{3}{5}$	= cost of 1 cwt.
				5	
		27	18	2	= cost of 5 cwt.
				11	
		306	19	10	= cost of 55ct. or 2tons 15ct.
	8 lbs. = $\frac{1}{14}$ of 1 cwt.		13	$11\frac{9}{20}$	= cost of 14 lbs.
	4 lbs. = $\frac{1}{2}$ of 8 lbs.		7	$11\frac{24}{35}$	= cost of 8 lbs.
	1 lb. = $\frac{1}{4}$ of 4lbs.		3	$11\frac{59}{70}$	= cost of 4 lbs.
				$11\frac{269}{280}$	= cost of 1 lb.
		£308	6	$8\frac{3}{4} . \frac{53}{70}q.$	= cost of 2 tons 15cwt. 27lbs.

		£.	s.	d.	
42.	3 sq. ft. = $\frac{1}{3}$ of 1 sq. yd.	0	13	$7\frac{3}{4}$	= cost of 1 sq. yard.
				4	
		2	14	7	= cost of 4 sq. yards.
				12	
		32	15	0	= cost of 48 sq. yards.
	3 sq. ft. = $\frac{1}{3}$ of 1 sq. yd.		4	$6\frac{7}{12}$	= cost of 3 sq. feet.
	1 sq. ft. = $\frac{1}{3}$ of 3 sq. ft.		4	$6\frac{7}{12}$	= cost of 3 sq. feet.
	1 sq. ft. = $\frac{1}{3}$ of 3 sq. ft.		1	$6\frac{7}{36}$	= cost of 1 sq. foot.
	72 sq. in. = $\frac{1}{2}$ of 1 sq. ft.		1	$6\frac{7}{36}$	= cost of 1 sq. foot.
	36 sq. in. = $\frac{1}{2}$ of 72 sq. in.			$9\frac{7}{72}$	= cost of 72 sq. inches.
	6 sq. in. = $\frac{1}{6}$ of 36 sq. in.			$4\frac{79}{144}$	= cost of 36 sq. inches.
				$\frac{655}{864}$	= cost of 6 sq. inches.
		£33	8	$3\frac{3}{4} . \frac{181}{216}$	= cost of 48 sq. yd. 8s.ft. 114s.in.

		£.	s.	d.	
43.	4 qts. = $\frac{1}{36}$ of 1 bar.	2	0	6	= cost of 1 barrel.
		1	0	3	= cost of $\frac{1}{2}$ barrel.
		3	0	9	= cost of $1\frac{1}{2}$ barrel or 1 hhd.
				2	
		6	1	6	= cost of 2 hhds.
		2	0	6	= cost of 1 barrel.
	1 qt. = $\frac{1}{4}$ of 4 qts.		1	$1\frac{1}{2}$	= cost of 4 quarts.
				$3\frac{1}{4} . \frac{1}{2}q.$	= cost of 1 quart.
		£8	3	$4\frac{3}{4} . \frac{1}{2}q.$	= cost of 2 hhds. 1 bar. 5 qts.

Ex. LIV. (p. 170.)

1. The area = (2 ft. 9 in. × 10 ft. 4 in.)

$$= \left(2\tfrac{3}{4} \times 10\tfrac{1}{3}\right) \text{sq. ft.} = \left(\frac{11}{4} \times \frac{31}{3}\right) \text{sq. ft.}$$

$$= \frac{341}{12} \text{sq. ft.} = 28\tfrac{5}{12} \text{ sq. ft.} = 3 \text{ sq. yds. } 1 \text{ sq. ft. } 60 \text{ sq. in.}$$

2. The area $= (17\frac{1}{4} \times 13\frac{5}{6})$ sq. ft.

$$= \left(\frac{69}{4} \times \frac{83}{6}\right) \text{sq. ft.} = \frac{1909}{8} \text{sq. ft.} = 238 \text{ sq. ft. } 90 \text{ sq. in.}$$

3. Area of ground $= (9\frac{1}{4} \times 3\frac{5}{12})$ sq. ft.

$$= \left(\frac{37}{4} \times \frac{41}{12}\right) \text{sq. ft.} = \frac{1517}{48} \text{sq. ft.} = 31 \text{ sq. ft. } 87 \text{ sq. in.}$$

4. Length of room $= \dfrac{\text{content of room in square feet}}{\text{width of room in linear feet}}$

$$= \frac{91 \times 9}{15\frac{1}{2}} \text{ ft.} = \frac{91 \times 9 \times 2}{31} \text{ ft.} = \frac{1638}{31} \text{ ft.} = 52\frac{26}{31} \text{ ft.}$$

5. Length of plot $= \dfrac{\text{content of plot in square feet}}{\text{breadth of plot in linear feet}}$

$$= \frac{832}{26} \text{ ft.} = 32 \text{ ft.}$$

6. Breadth of room $= \dfrac{\text{area in square feet}}{\text{length of room in feet}}$

$$= \frac{795}{2} \div \frac{45}{2} = \frac{795}{45} = \frac{159}{9} = 17 \text{ ft. } 8 \text{ in.}$$

7. Number of planks required $= \dfrac{\text{area of floor in square inches}}{\text{area of each plank in square inches}}$

$$= \frac{50 \times 12 \times 16 \times 12}{150 \times \frac{17}{2}} = \frac{12 \times 16 \times 12 \times 2}{3 \times 17} = \frac{1536}{17} = 90\tfrac{6}{17}.$$

8. Area of building $= (78\frac{5}{12} \times 78\frac{5}{12})$ sq. ft.

$$= \left(\frac{941 \times 941}{12 \times 12}\right) \text{sq. ft.} = \frac{885481}{144} \text{sq. ft.} = 6149\tfrac{25}{144}$$

$$= 683 \text{ sq. yds. } 2 \text{ sq. ft. } 25 \text{ sq. in.}$$

9. Area $= (30\frac{1}{2} \times 8\frac{3}{4})$ sq. ft.

$$= \frac{61 \times 35}{2 \times 4} \text{sq. ft.} = \frac{2135}{8} \text{sq. ft.};$$

$$\therefore \text{ cost} = \left(\frac{2135}{8} \times \frac{14}{3}\right) s. = \frac{14945}{12} = £62\ 5s.\ 5d.$$

10. Area of slab $= (5\frac{7}{12} \times 3\frac{2}{3})$ sq. ft.;

$$\therefore \text{ cost} = \left(\frac{67}{12} \quad \frac{11}{3} \times 3\right) s. = \frac{737}{12} s. = £3\ 1s.\ 5d.$$

11. Area of floor $= (18\tfrac{1}{2} \times 12\tfrac{1}{4})$ sq. ft. $= \dfrac{37 \times 49}{2 \times 4 \times 9}$ sq. yds.;

$\therefore$ cost of carpet $= \dfrac{37 \times 49 \times 3}{2 \times 4 \times 9}\,s. = \dfrac{1813}{24}\,s. =$ £3 15*s.* 6½*d.*

12. (1) Area $= (23\tfrac{1}{2} \times 20)$ sq. ft. $= 470$ sq. ft. $= \dfrac{470}{9}$ sq. yds.;

$\therefore$ cost of painting $= \left(\dfrac{470 \times 9}{9 \times 2}\right) s. = 235s. =$ £11 15*s.*

(2) Area $= (14\tfrac{1}{4} \times 11\tfrac{11}{12})$ sq. ft. $= \left(\dfrac{57 \times 143}{4 \times 12}\right)$ sq. ft.;

$\therefore$ cost $= \left(\dfrac{57 \times 143 \times 16}{4 \times 12}\right) d. = (19 \times 143)\, d. = 2717d. =$ £11 6*s.* 5*d.*

(3) Area $= (13\tfrac{1}{2} \times 8\tfrac{3}{4})$ sq. ft. $= \left(\dfrac{27 \times 35}{2 \times 4 \times 9}\right)$ sq. yds.;

$\therefore$ cost $= \left(\dfrac{27 \times 35}{2 \times 4 \times 9} \times \dfrac{23}{3}\right) s. = \dfrac{805}{8}\,s. =$ £5 0*s.* 7½*d.*

13. (1)

$$\begin{array}{rcrcl}
\text{ft.} & & \text{in.} & & \\
18 & . & 9 & & \\
14 & . & 7 & & \\
\hline
262 & . & 6 & & \\
10 & . & 11 & . & 3'' \\
\hline
\text{sq. ft. } 273 & . & 5 & . & 3''
\end{array}
= \left(273 + \frac{5}{12} + \frac{3}{144}\right) \text{ sq. ft.}$$

$$= \left(273 + \frac{63}{144}\right) \text{ sq. ft.} = 273 \text{ sq. ft. } 63 \text{ sq. in.}$$

Proof by fractions.

$$(18\tfrac{3}{4} \times 14\tfrac{7}{12}) \text{ sq. ft.} = \left(\frac{75 \times 175}{4 \times 12}\right) \text{ sq. ft.}$$

$$= \frac{4375}{16} \text{ sq. ft.} = 273 \text{ sq. ft. } 63 \text{ sq. in.}$$

(2)

$$\begin{array}{rcl}
\text{ft.} & & \\
23 & . & 8' \\
16 & . & 9 \\
\hline
378 & . & 8 \\
17 & . & 9 \\
\hline
396 & . & 5
\end{array}
\text{ sq. ft.} = \left(396 + \frac{5}{12}\right) \text{ sq. ft.} = 396 \text{ sq. ft. } 60 \text{ sq. in.}$$

Proof by fractions.

$$(23\tfrac{2}{3} \times 16\tfrac{3}{4}) \text{ sq. ft.} = \left(\frac{71 \times 67}{12}\right) \text{ sq. ft.} = \frac{4757}{12} \text{ sq. ft.} = 396 \text{ ft. } 60 \text{ sq. in.}$$

$$(3)\quad\begin{array}{rrrrr} \text{ft.} & & & & \\ 27\,. & 6'\,. & 9'' & & \\ 5\,. & 3 & & & \\ \hline 137\,. & 9\,. & 9 & & \\ 6\,. & 10\,. & 8\,. & 3''' & \\ \hline \text{sq. ft. } 144\,. & 8\,. & 5\,. & 3 & \end{array} \qquad (4)\quad\begin{array}{l} \text{ft.}\quad\text{in.} \\ 22\,.\,8\tfrac{3}{4} = \\ 16\,.\,7\tfrac{1}{2} = \end{array}\begin{array}{rrrrr} \text{ft.} & & & & \\ 22\,. & 8'\,. & 9'' & & \\ 16\,. & 7\,. & 6 & & \\ \hline 363\,. & 8\,. & 0 & & \\ 13\,. & 3\,. & 1\,. & 3''' & \\ & 11\,. & 4\,. & 4\,. & 6'''' \\ \hline \text{sq. ft. } 377\,. & 10\,. & 5\,. & 7\,. & 6 \end{array}$$

$$(5)\quad\begin{array}{rrrrr} \text{ft.} & & & & \\ 4\,. & 6'\,. & 5'' & & \\ 9\,. & 4\,. & 7 & & \\ \hline 40\,. & 9\,. & 9 & & \\ 1\,. & 6\,. & 1\,. & 8''' & \\ & 2\,. & 7\,. & 8\,. & 11'''' \\ \hline \text{sq. ft. } 42\,. & 6\,. & 6\,. & 4\,. & 11'''' \end{array} \qquad (6)\quad\begin{array}{rrrr} \text{ft.} & & & \\ 75\,. & 7'\,. & 4'' & \\ 38\,. & 3\,. & 3 & \\ \hline 2873\,. & 2\,. & 8 & \\ 18\,. & 10\,. & 10\,. & 0''' \\ 1\,. & 6\,. & 10\,. & 10 \\ \hline \text{sq. ft. } 2893\,. & 8\,. & 4\,. & 10 \end{array}$$

$$(7)\quad\begin{array}{rrrrr} \text{ft.} & & & & \\ 17\,. & 2'\,. & 3'' & & \\ 15\,. & 11\,. & 7 & & \\ \hline 257\,. & 9\,. & 9 & & \\ 15\,. & 9\,. & 0\,. & 9''' & \\ & 10\,. & 0\,. & 3\,. & 9'''' \\ \hline \text{sq. ft. } 274\,. & 4\,. & 10\,. & 0\,. & 9'''' \end{array}$$

14. Area of floor $= (40\tfrac{2}{3} \times 24\tfrac{1}{2})$ sq. ft.

$$= \frac{122 \times 49}{3 \times 2} \text{ sq. ft.} = \frac{122 \times 49}{3 \times 2 \times 9} \text{ sq. yds.};$$

$$\therefore \text{ linear yards in carpet} = \frac{122 \times 49}{3 \times 2 \times 9} \div \tfrac{1}{2}$$

$$= \frac{122 \times 49}{27} \text{ yds.} = 221\tfrac{11}{27} \text{ yds.}$$

15. Area of wall $= (15\tfrac{2}{3} \times 11\tfrac{1}{4})$ sq. ft.

$$= \frac{47 \times 45}{3 \times 4 \times 9} \text{ sq. yds.} = \frac{235}{12} \text{ sq. yds.};$$

$$\therefore \text{ linear yards of paper} = \left(\frac{235}{12} \div \frac{3}{4}\right) \text{ yds.}$$

$$= \frac{235}{9} \text{ yds.} = 26 \text{ yds. } 0 \text{ ft. } 4 \text{ in.}$$

16. Area of floor $= \left(\frac{20 \times 18}{9}\right)$ sq. yds. $= 40$ sq. yds.

$$\therefore \text{ linear yards in carpet} = \left(40 \div \frac{3}{4}\right) \text{ yds.} = \frac{160}{3} \text{ yds.};$$

$$\therefore \text{ cost of carpet} = \left(\frac{160 \times 45}{3}\right) d. = 2400d. = £10.$$

17. (1) Area of floor $= (12\frac{1}{3} \times 12\frac{1}{2})$ sq. ft. $= \frac{37 \times 25}{3 \times 2 \times 9}$ sq. yds.;

$\therefore$ length of carpet $= \frac{37 \times 25 \times 4}{3 \times 2 \times 9 \times 3}$ linear yds.

$\therefore$ cost of carpet $= \left(\frac{37 \times 25 \times 4 \times 54}{3 \times 2 \times 9 \times 3}\right) d. = \frac{3700}{3} d. = 1233\frac{1}{3}d.$

$= £5\ 2s.\ 9\frac{1}{3}d.$

(2) Area of floor $= (29\frac{1}{2} \times 14\frac{1}{4})$ sq. ft. $= \frac{59 \times 57}{2 \times 4 \times 9}$ sq. yds.;

$\therefore$ length of carpet $= \frac{59 \times 57 \times 8}{2 \times 4 \times 9 \times 5}$ linear yds.;

$\therefore$ cost $= \frac{59 \times 57 \times 42}{9 \times 5} d. = \frac{15694}{4} d. = £13\ 1s.\ 6\frac{3}{4}.\frac{1}{8}q.$

(3) Area of floor $= (15\frac{1}{2} \times 12\frac{3}{4})$ sq. ft. $= \frac{31 \times 51}{2 \times 4 \times 9}$ sq. yds.;

$\therefore$ length of carpet $= \frac{31 \times 51 \times 36}{2 \times 4 \times 9 \times 24}$ linear yds.;

$\therefore$ cost $= \frac{31 \times 51 \times 36 \times 92}{2 \times 4 \times 9 \times 24} d. = \frac{36363}{12} d. = £12\ 12s.\ 6\frac{1}{4}d.$

(4) Area of floor $= \left(\frac{53}{2} \times 18\right)$ sq. ft. $= \frac{53 \times 9}{9}$ sq. yds. $= 53$ sq. yds.;

$\therefore$ length of carpet $= \frac{53 \times 4}{3}$ linear yds.;

$\therefore$ cost $= \frac{212 \times 40}{3} d. = \frac{8480}{3} d. = £11\ 15s.\ 6\frac{1}{2}.\frac{2}{3}q.$

(5) Area of floor $= (19\frac{7}{12} \times 18\frac{11}{12})$ sq. ft. $= \frac{235 \times 227}{12 \times 12 \times 9}$ sq. yds.;

$\therefore$ length of carpet $= \frac{235 \times 227 \times 36}{12 \times 12 \times 9 \times 25}$ yds.;

$\therefore$ cost $= \frac{235 \times 227 \times 36 \times 56}{12 \times 12 \times 9 \times 25} d. = \frac{47 \times 227 \times 14}{3 \times 3 \times 5} d.$

$= \frac{149366}{45} d. = £13\ 16s.\ 7\frac{11}{45}d.$

18. (1) Content of timber $= (54\tfrac{1}{2} \times 5 \times 2\tfrac{5}{12})$ cub. ft.

$$= \frac{109 \times 5 \times 29}{2 \times 12} \text{ c. ft.} = \frac{15805}{24} \text{ c. ft.} = 658 \text{ c. ft. } 936 \text{ c. in.};$$

$$\therefore \text{ cost} = \frac{15805 \times 9}{24} d. = \frac{47415}{8} d. = £24 \ 13s. \ 10\tfrac{3}{4}d. \tfrac{1}{2}q.$$

(2) Content of cube $= (1\tfrac{2}{3} \times 1\tfrac{2}{3} \times 1\tfrac{2}{3})$ c. ft.

$$= \frac{5 \times 5 \times 5}{3 \times 3 \times 3} \text{ c. ft.} = \frac{125}{27} \text{ c. ft.} = 4 \text{ c. ft. } 1088 \text{ c. in.};$$

$$\therefore \text{ cost} = \left(\frac{125}{27} \times 1728 \times 6\right) d. = (125 \times 64 \times 6) d.$$

$$= \frac{125 \times 64 \times 6}{20 \times 12} £ = (25 \times 8) £ = 200 £.$$

(3) Content of cellar $= (12 \times 12 \times 12)$ c. ft.

$$= \frac{12 \times 12 \times 12}{27} \text{ c. yds.} = 64 \text{ c. yds.};$$

$$\therefore \text{ cost} = (64 \times 9) d. = £2 \ 8s.$$

(4) Content of cistern $= \left(6 \times \frac{5}{2} \times \frac{5}{2}\right)$ c. ft.

$$= \frac{75}{2} \text{ c. ft.} = 1 \text{ c. yd. } 10\tfrac{1}{2} \text{ c. ft.}$$

(5) Content of wall $= (1000 \times \frac{21}{2} \times 2\tfrac{1}{8})$ c. ft. $= \frac{125 \times 21 \times 17}{2}$ c. ft.

$$= \frac{44625}{2} \text{ c. ft.} = 826 \text{ c. yds. } 10\tfrac{1}{2} \text{ c. ft.}$$

(6) Content of cube $= (13\tfrac{91}{144} \times 13\tfrac{91}{144} \times 13\tfrac{91}{144})$ c. ft.

$$= \frac{1963 \times 1963 \times 1963}{144 \times 144 \times 144} \text{ c. ft.} = \frac{7564163347}{2985984} \text{ c. ft.}$$

$$= 2533\tfrac{665875}{2985984} \text{ c. ft.}$$

19. Area of floor $= (23\tfrac{10}{12} \times 18\tfrac{1}{3})$ sq. ft.

$$= \frac{143 \times 55}{6 \times 3} \text{ sq. ft.} = \frac{7865}{18} \text{ sq. ft.} = 436 \text{ s. ft. } 136 \text{ s. in.}$$

Volume of room $= (23\tfrac{5}{6} \times 18\tfrac{1}{3} \times 11\tfrac{1}{4})$ c. ft.

$$= \frac{7865 \times 45}{18 \times 4} \text{ c. ft.} = \frac{353925}{72} \text{ c. ft.} = 4915 \text{ c. ft. } 1032 \text{ c. in.}$$

20. Area of walls = 2 (length + breadth) × height

$$= (2 \times 42 \times 12\tfrac{5}{6}) \text{ sq. ft.} = (2 \times 7 \times 77) \text{ sq. ft.};$$

$$\therefore \text{ length of paper} = \left(\frac{2 \times 7 \times 77}{9} \times \frac{8}{7}\right) \text{ yds.} = \frac{1232}{9} \text{ yds.}$$

$$= 136 \text{ yds. } 2 \text{ ft. } 8 \text{ in.}$$

21. Area of walls = 2 (length + breadth) × height

$$= (2 \times 39\tfrac{11}{12} \times 11\tfrac{1}{2}) \text{ sq. ft.} = \frac{479 \times 23}{12} \text{ sq. ft.};$$

$$\therefore \text{ cost} = \frac{479 \times 23 \times 48}{12} d. = 44068\, d. = £183\ 12s.\ 4d.$$

22. (1) Area of walls = 2 (length + breadth) × height

$$= (2 \times 32\tfrac{5}{12} \times 14) \text{ sq. ft.}$$

Area of ceiling = length × breadth $= (16\tfrac{2}{3} \times 15\tfrac{3}{4})$ sq. ft.;

$$\therefore \text{ whole content} = \left(\frac{389 \times 7}{3} + \frac{25 \times 21}{2}\right) \text{ sq. ft.}$$

$$= \left(\frac{2723}{3} + \frac{525}{2}\right) \text{ sq. ft.} = \frac{7021}{6} \text{ sq. ft.};$$

$$\therefore \text{ cost} = \frac{7021}{6 \times 9} s. = 130\tfrac{1}{54} s. = £6\ 10\tfrac{1}{54} s.$$

(2) Area to be painted = area of walls + area of ceiling

$$= (2 \times 25 \times 9\tfrac{3}{4}) \text{ sq. ft.} + (15 \times 10) \text{ sq. ft.}$$

$$= \left(\frac{975}{2} + 150\right) \text{ sq. ft.} = \frac{1275}{2 \times 9} \text{ sq. yds.};$$

$$\therefore \text{ cost} = \frac{1275 \times 16}{2 \times 9} d. = \frac{850}{9} s. = £4\ 14s.\ 5\tfrac{1}{4}d.\ \tfrac{1}{3}q.$$

(3) Area of walls $= \left(\frac{83}{2} \times \frac{101}{12}\right) \text{ ft.} = \frac{83 \times 101}{2 \times 12 \times 9} \text{ sq. yds.};$

$$\therefore \text{ cost} = \frac{83 \times 101 \times 11}{2 \times 12 \times 9} d. = \frac{92213}{216} d. = £1\ 15s.\ 6\tfrac{3}{4}d.\ \tfrac{35}{54}q.$$

(4) Area of walls = $(72 \times 10\tfrac{1}{4})$ sq. ft.

$$= (18 \times 41) \text{ sq. ft.} = \frac{18 \times 41}{9} \text{ sq. yds.};$$

$$\therefore \text{ cost} = (2 \times 41 \times 10\tfrac{1}{2})\, d. = 861\, d. = £3\ 11s.\ 9d.$$

Again, area of walls in Ex. (1) $= \dfrac{389 \times 7}{3 \times 9}$ sq. yds.;

$\therefore$ length of paper required $= \left(\dfrac{389 \times 7}{3 \times 9} \times \dfrac{36}{21}\right)$ yds. $= \dfrac{389 \times 4}{9}$ yds.;

$\therefore$ cost $= \dfrac{389 \times 4 \times 42}{9}$ *d.* = £30 5*s.* 1⅓*d.*

Also, area of walls in Ex. (2) $= \left(\dfrac{975}{2 \times 9}\right)$ sq. yds.;

$\therefore$ length of paper required $= \left(\dfrac{975}{2 \times 9} \times \dfrac{36}{21}\right)$ yds. $= \dfrac{325 \times 2}{7}$ yds.;

$\therefore$ cost $= \dfrac{325 \times 2 \times 14}{7}$ *d.* = 1300*d.* = £5 8*s.* 4*d.*

23. Area of walls = 2 (22 ft. 3 in. + 17 ft. 9 in.) × (12 in. 6 in.)

= 2 (40 × 12½) sq. ft. = 1000 sq. ft.;

$\therefore$ length of paper required $= \dfrac{1000}{2}$ ft. = 500 ft. = 166 yds. 2 ft.;

and cost at 3*d.* per foot will be 1500*d.* = £6 5*s.*

24. £6 5*s.* ÷ 5*s.* = 25, the number of sq. yards in the carpet;

$\therefore$ breadth of room $= \dfrac{25 \times 9}{25}$ ft. = 9 ft.

25. Area of court = (96 × 84) sq. ft. = 8064 sq. ft.;

area of grass plots = (4 × 22½ × 18) sq. ft. = 1620 sq. ft.;

$\therefore$ the number of sq. ft. to be paved = 8064 − 1620 = 6444;

$\therefore$ number of sq. yds. $= \dfrac{6444}{9} = 716$;

$\therefore$ cost = (716 × 8½) *d.* = 6086 *d.* = £25 7*s.* 2*d.*

26. (Required breadth in linear yards × 74⅔) = 94½ × 1⅛;

$\therefore$ breadth $= \left(\dfrac{189 \times 9}{2 \times 8} \div \dfrac{224}{3}\right)$ yds. $= \left(\dfrac{189 \times 9 \times 3}{2 \times 8 \times 224}\right)$ yds.

$= \dfrac{5103}{3584}$ yds. $= 1\frac{1519}{3584} = 1\frac{217}{512}$ yds.

27. Area of room $= (16\frac{3}{4} \times 12\frac{11}{12})$ sq. ft. $= \frac{10385}{48}$ sq. ft.;

$\therefore$ number of sq. ft. of carpet remaining

$$= 313 - \frac{10385}{48} = \frac{4639}{48} = 96\frac{31}{48} = 96 \text{ sq. ft. } 93 \text{ sq. in.}$$

Also, price of carpet

$$= \left(\frac{10385}{48} \times \frac{1}{9} \times 3\frac{1}{2}\right) s. = \frac{72695}{864} s. = £4\ 4s.\ 1\frac{47}{72}d.$$

28. Area of each sod $= (2\frac{1}{2} \times \frac{3}{4})$ sq. ft.

Area of one strip $= \left(\frac{5 \times 3 \times 75}{2 \times 4}\right)$ sq. ft.

Area laid down daily $= \left(\frac{5 \times 3 \times 75 \times 5}{2 \times 4 \times 4}\right)$ sq. ft.

Area laid down in 8 days $= \left(\frac{5 \times 3 \times 75 \times 5}{4}\right)$ sq. ft.

$\therefore$ required space $= \frac{5625}{4}$ sq. ft. $= 156$ sq. yds. 2 sq. ft. 36 sq. in.

29. Area of first piece $= (151\frac{5}{12} \times 35)$ sq. yds. $= \left(\frac{1817 \times 35}{12}\right)$ sq. yds.;

$\therefore$ length of strip

$$= \left(\frac{1817 \times 35}{12} \div 15\frac{5}{6}\right) \text{yds.} = \frac{1817 \times 35 \times 6}{12 \times 95} \text{yds.} = 334 \text{ yds. } 2\frac{5}{38} \text{ ft.}$$

30. Area of first floor $= (80\frac{3}{4} \times 65\frac{1}{2})$ sq. ft. $= \frac{42313}{8}$ sq. ft.

Area of 3 other floors $= 3\left(\frac{323}{12} \times \frac{131}{6}\right)$ sq. ft. $= \frac{42313}{24}$ sq. ft.;

$\therefore$ difference of content

$$= \left(\frac{42313}{8} - \frac{42313}{24}\right) = \frac{42313}{12} \text{ sq. ft.} = 391 \text{ sq. yds. } 7 \text{ sq. ft. } 12 \text{ sq. in.}$$

31. Cubic content of part drawn off

$$= (24\frac{2}{3} \times 12\frac{3}{4} \times 1) \text{ c. ft.} = \frac{74 \times 51}{3 \times 4} \text{ c. ft.} = \frac{629}{2} \text{ c. ft.} = 314\frac{1}{2} \text{ c. ft.}$$

32. 1532 sq. ft. $9\frac{9}{12}$ sq. in. $\div$ 81 ft. 9 in. $= 1532\frac{13}{16}$ sq. ft. $\div 81\frac{3}{4}$ ft.

$$= \frac{24525 \times 4}{16 \times 327} \text{ ft.} = \frac{75}{4} \text{ ft.} = 18 \text{ ft. } 9 \text{ in.,}$$

also breadth of room $= 250\frac{5}{6}$ sq. ft. $\div\ 17\frac{1}{2}$ ft.

$$= \frac{1505 \times 2}{6 \times 35}\text{ ft.} = 14\tfrac{1}{3}\text{ ft.}$$

33. Area of windows of ground and first floors

$$= (24 \times 7\tfrac{1}{2} \times 3\tfrac{1}{2})\text{ sq. ft.} = 630\text{ sq. ft.,}$$

area of windows in second floor

$$= (12 \times 6\tfrac{5}{6} \times 3\tfrac{1}{2})\text{ sq. ft.} = 287\text{ sq. ft.,}$$

area of windows in third floor

$$= (12 \times 6 \times 3\tfrac{1}{2})\text{ sq. ft.} = 252\text{ sq. ft.};$$

$\therefore$ amount of glazing = 1169 sq. ft.;

$\therefore$ cost = 11690*d.* = £48 14*s.* 2*d.*

34. Content of wall $= (60 \times 7\frac{1}{2} \times 1\frac{1}{6})$ c. ft. $= (5 \times 15 \times 7)$ c. ft.;

content of each brick $= (9 \times 3\frac{1}{2} \times 2\frac{1}{2})$ c. in. $= \dfrac{9 \times 7 \times 5}{4 \times 1728}$ c. ft.;

$\therefore$ number of bricks required

$$= (5 \times 15 \times 7) \div \left(\frac{9 \times 7 \times 5}{4 \times 1728}\right) = \frac{5 \times 15 \times 7 \times 4 \times 1728}{9 \times 7 \times 5}$$

$$= 5 \times 4 \times 576 = 11520.$$

35. Content of cistern $= (18\frac{2}{3} \times 18\frac{1}{3} \times 6\frac{3}{4})$ c. ft. $= (14 \times 55 \times 3)$ c. ft.;

$\therefore$ weight of water $= (14 \times 55 \times 3 \times 1000)$ oz. = 64 tons 9 cwt. 7 lbs.

36. A cubic rod of brickwork

$= (272\frac{1}{4} \times 1\frac{1}{6})$ c. ft., see p. 90 in Arithmetic.

Content of wall

$$= (77 \times 16 \times 1\tfrac{7}{8})\text{ c. ft.} = (77 \times 2 \times 15)\text{ c. ft.};$$

$\therefore$ number of rods of brickwork

$$= \frac{77 \times 2 \times 15}{272\frac{1}{4} \times 1\frac{1}{6}} = \frac{77 \times 2 \times 15 \times 4 \times 6}{1089 \times 7} = \frac{80}{11} = 7\tfrac{3}{11}.$$

37. Area of one side of chest $= (2\frac{5}{12} \times 2\frac{5}{12})$ sq. ft.;

$\therefore$ area of six sides $= \dfrac{6 \times 29 \times 29}{12 \times 12}$ sq. ft. $= \dfrac{6 \times 29 \times 29}{12 \times 12 \times 9}$ sq. yds.;

$$\therefore\ \text{cost} = \frac{29 \times 29 \times 15}{2 \times 12 \times 9}\,d. = \frac{4205}{72}\,d. = 4s.\ 10\tfrac{1}{4}d.\ \tfrac{11}{18}q.$$

38. Area of walls $= 2(20\frac{1}{4}\text{ ft.} + 18\frac{1}{2})\text{ ft.} \times 10\text{ ft.} = 775$ sq. ft.,

area of windows $= (2 \times 7 \times 4)$ sq. ft. $= 56$ sq. ft.;

$\therefore$ area to be painted $= 719$ sq. ft.,

$$\therefore \text{ cost} = \frac{719 \times 30}{9}\,d. = \frac{21570}{9}\,d. = £9\ 19s.\ 8\tfrac{1}{2}d.\ \tfrac{2}{3}q.$$

39. £19 ÷ 4s. 9d. gives 80 as the number of square yards in the cloth.

Now length × breadth = 80 sq. yds.;

$\therefore$ 5 breadth × breadth = 80 sq. yds.;

$\therefore$ breadth × breadth = 16 sq. yds.;

$\therefore$ breadth = 4 yards,

and length = 20 yards.

40. Length of plank $\times 1\frac{1}{8}$ ft. $\times \frac{4}{5}$ ft. $= 11\frac{1}{4}$ c. ft.

$$\text{length} \times \frac{18}{20}\text{ sq. ft.} = \frac{45}{4}\text{ c. ft.};$$

$$\therefore \text{ length} = \left(\frac{45}{4} \times \frac{20}{18}\right)\text{ ft.} = \frac{25}{2}\text{ ft.} = 12\tfrac{1}{2}\text{ ft.}$$

41. Content of Turkey carpet

$$= (11\tfrac{1}{2} \times 9\tfrac{2}{3})\text{ ft.} = \frac{667}{6}\text{ sq. ft.}$$

area of room $= (14 \times 12\frac{1}{2})$ sq. ft. $= 175$ sq. ft.;

$\therefore$ area to be covered with Brussels carpet

$$= \left(175 - \frac{667}{6}\right)\text{ sq. ft.} = \frac{383}{6}\text{ sq. ft.};$$

$\therefore$ length of Brussels carpet

$$= \left(\frac{383}{6 \times 9} \times \frac{4}{3}\right)\text{ yds.} = \frac{766}{81}\text{ yds.} = 9\text{ yds. } 1\tfrac{10}{27}\text{ ft.};$$

$$\text{cost} = \left(\frac{766}{81} \times 45\right)d. = \frac{11490}{27}\,d. = £1\ 15s.\ 5\tfrac{1}{2}d.\ \tfrac{2}{9}q.$$

42.

```
ft.
20 . 4'
 1 . 5
-------
20 . 4
 8 . 5 . 8"
-----------
28 . 9 . 8"
    10 . 0
--------------
24 . 0 . 0 . 8"' = 24 cub. ft. 8 cub. in.
                 = 24 1/216 cub. ft.
```

Also, by fractions:

$$\text{cubic content} = \left(20\tfrac{1}{3} \times 1\tfrac{5}{12} \times \frac{10}{12}\right) \text{ c. ft.}$$

$$= \frac{61 \times 17 \times 10}{3 \times 12 \times 12} = \frac{5185}{216} \text{ c. ft.} = 24\tfrac{1}{216} \text{ c. ft.}$$

43. Width of room × $10\tfrac{1}{2}$ yds. = $(69 \times \tfrac{3}{4})$ sq. yds.;

$$\therefore \text{ width of room} = \left(\frac{69 \times 3}{4} \times \frac{2}{21}\right) \text{ yds.} = \frac{69}{14} \text{ yds.} = 4\tfrac{13}{14} \text{ yds.}$$

44. Area of walls

$$= 2\,(16\tfrac{5}{6} \text{ ft.} + 15\tfrac{3}{4})\text{ ft.} \times 12\tfrac{1}{2} \text{ ft.} = (2 \times 32\tfrac{7}{12} \times 12\tfrac{1}{2}) \text{ sq. ft.}$$

$$= \frac{2 \times 391 \times 25}{12 \times 2} \text{ sq. ft.} = \frac{391 \times 25 \times 144}{12} \text{ sq. in.}$$

Area of a postage stamp = $(1 \times \tfrac{4}{5})$ sq. in.;

∴ number of stamps required

$$= \frac{391 \times 25 \times 12}{\frac{4}{5}} = \frac{391 \times 25 \times 12 \times 5}{4} = 391 \times 25 \times 3 \times 5 = 146625.$$

45. Area of walls = $2(36 + 24)$ ft. × 20 ft. = 2400 sq. ft.

Area of fire place = $(6 \times 5\tfrac{1}{2})$ sq. ft. = 33 sq. ft.

Area of windows = $(2 \times 7\tfrac{1}{2} \times 3\tfrac{3}{4})$ sq. ft. = $56\tfrac{1}{4}$ sq. ft.;

∴ area for painting

$$= (2400 - 89\tfrac{1}{4}) \text{ sq. ft.} = 2310\tfrac{3}{4} \text{ sq. ft.} = 256\tfrac{3}{4} \text{ sq. yds.};$$

also length of paper required

$$= (2310\tfrac{3}{4} \div 2\tfrac{1}{4}) \text{ ft.} = \frac{9243}{9} \text{ ft.} = 1027 \text{ ft.};$$

$$\therefore \text{ cost of paper} = \frac{1027 \times 11}{3} d. = \frac{11297}{3} d. = £15\ 13s.\ 9\tfrac{1}{2}d.\ \tfrac{2}{3}q.$$

46. Content of each brick = $(9 \times 4\tfrac{1}{2} \times 3)$ c. in.;

content of wall = $(3600 \times 180 \times 22\tfrac{1}{2})$ c. in.;

∴ number of bricks required

$$= \left(\frac{3600 \times 180 \times 45}{2}\right) \div \left(\frac{9 \times 9 \times 3}{2}\right)$$

$$= \frac{3600 \times 180 \times 45}{9 \times 9 \times 3} = 400 \times 60 \times 5 = 24000 \times 5 = 120000.$$

47. Area of garden $= (200 \times 180)$ sq. ft.;

$$\therefore \text{ area of path} = \frac{200 \times 180}{8} \text{ sq. ft.};$$

also length of path $= 200$ ft.;

$$\therefore \text{ width of path} = \frac{200 \times 180}{8 \times 200} \text{ ft.} = \frac{180}{8} \text{ ft.} = 22\tfrac{1}{2} \text{ ft.}$$

48. $$\text{Area of wall} = \left(45 \times 7 \times \frac{13}{12}\right) \text{ c. ft.} = \frac{1365}{4} \text{ c. ft.};$$

$$\text{area of door} = \left(6 \times 4 \times \frac{13}{12}\right) \text{ c. ft.};$$

$$\therefore \text{ area to be bricked} = \frac{1365 - 104}{4} \text{ c. ft.} = (1261 \times 432) \text{ c. in.};$$

$$\therefore \text{ number of bricks} = \frac{1261 \times 432}{108} = 1261 \times 4 = 5044.$$

49. Area of road $= 4(85 + 85 + 56 + 56)$ sq. yds. $+ (4 \times 16)$ sq. yds.
$= 1192$ sq. yds.;
$\therefore$ cost $= (1192 \times 14)$ *d.* $=$ £69 10*s.* 8*d.*

50. Area to be paved $= (4 \times 225 \times 45)$ sq. ft. $+ (4 \times 45 \times 45)$ sq. ft.
$= (1080 \times 45)$ sq. ft.;

$$\text{also area of each stone} = \frac{4}{15} \text{ sq. ft.};$$

$$\therefore \text{ number required} = \frac{1080 \times 45 \times 15}{4} = 182250.$$

51. Area of court yard $= (126 \times 98)$ sq. ft.;
$\therefore$ cost of paving with pebbles

$$= \left(\frac{126 \times 98 \times 9}{9}\right) d. = (126 \times 98)\, d. = £51\ 9s.;$$

area of granite path
$= (2 \times 5\tfrac{1}{2} \times 126)$ sq. ft. $+ (2 \times 5\tfrac{1}{2} \times 87)$ sq. ft. $= (11 \times 213)$ sq. ft.;

$$\therefore \text{ cost of path} = \frac{11 \times 213 \times 126}{9}\, d. = 32802d. = £136\ 13s.\ 6d.$$

52. Area of moat
$= 2 \times (1902 \text{ ft.} + 34 \text{ yds.}) \times 17 \text{ yds.} + (2 \times 1020 \text{ft.} \times 17 \text{ yds.})$
$= (2 \times 2004 \times 51)$ sq. ft. $+ (2 \times 1020 \times 51)$ sq. ft.
$= (102 \times 3024)$ sq. ft.

Again: quantity of soil on the lawn when raised two feet

$$=(1902 \times 1020 \times 2) \text{ cub. ft.};$$

therefore, depth of moat $= \dfrac{1902 \times 1020 \times 2}{102 \times 3024}$ ft.

$$= \frac{19020}{1512} \text{ ft.} = \frac{4755}{378} \text{ ft.} = \frac{1585}{126} \text{ ft.} = 12 \text{ ft. } 6\tfrac{20}{21} \text{ in.}$$

53. Area of 2 sides $= 2 \times 10$ ft. 3 in. $\times 5$ ft. $4\frac{1}{2}$ in.,

area of 2 sides $= 2 \times 6$ ft. 6 in. $\times 5$ ft. $4\frac{1}{2}$ in.,

area of bottom $= 10$ ft. 3 in. $\times 6$ ft. 6 in.;

therefore, whole area to be lined with lead

$$= (10\tfrac{1}{4} \times 10\tfrac{3}{4} + 6\tfrac{1}{2} \times 10\tfrac{3}{4} + 10\tfrac{1}{4} \times 6\tfrac{1}{2}) \text{ sq. ft.}$$

$$= \left(\frac{1763}{16} + \frac{559}{8} + \frac{533}{8}\right) \text{sq. ft.} = \frac{3947}{16} \text{ sq. ft.};$$

therefore, weight of lead required $= \dfrac{3947}{2}$ lbs.;

therefore, cost $= \dfrac{3947 \times 42}{2 \times 112}\,s. = \dfrac{11841}{16}\,s. = 740\tfrac{1}{16}s. = £37\ 0s.\ 0\tfrac{3}{4}d.$

54. Content of cistern $= (87 \times 44 \times 34)$ cub. in.

Now an imperial gallon contains

277·274 cub. in. (see page 96 of *Arithmetic*);

therefore, number of gallons

$$= \frac{87 \times 44 \times 34 \times 1000}{277274} = \frac{65076000}{138637} = 469\tfrac{55247}{138637}.$$

MISCELLANEOUS QUESTIONS AND EXAMPLES.

Ex. LV. (p. 183.)

I.

(1) $34{\cdot}17 \div 3\frac{1}{4} = \dfrac{34{\cdot}17 \times 4}{13} = \dfrac{136{\cdot}68}{13} = 10{\cdot}51\dot{3}8461\dot{5}.$

(2) Value in £ $= £\,\dfrac{1556{\cdot}85}{24{\cdot}25} = £64{\cdot}2 = £64\ 4s.$

(3) $\frac{1}{3}+\frac{1}{6}+\frac{1}{14}+\frac{3}{56}=\frac{3}{6}+\frac{7}{56}=\frac{1}{2}+\frac{1}{8}=\frac{5}{8}=\cdot625.$

$$28\left\{\begin{array}{r|l} & \text{lbs.} \\ 7 & 7. \\ 4 & 1\cdot0 \\ 4 & 1\cdot25 \\ & \cdot3125 \end{array}\right.$$

(4)

	£.	s.	d.	
10s. = £½	365	0	0	= cost at £1 at each ton
2s. = ⅕ of 10s.	182	10	0	= cost at 10s. each
1s. = ½ of 2s.	36	10	0	= cost at 2s. each
4d. = ⅓ of 1s.	18	5	0	= cost at 1s. each
1d. = ¼ of 4d.	6	1	8	= cost at 4d. each
½d. = ½ of 1d.	1	10	5	= cost at 1d. each
¼d. = ½ of ½d.	0	15	2½	= cost at ½d. each
	0	7	7¼	= cost at ¼d. each
	245	19	10¾	= cost at 365 tons
½ of 13s. 5¾d. =	0	6	8⅞	= cost of ½ ton
	£246	6	7⅝	= cost of 365½ tons.

	£.	s.	d.	
2 ro. = ½ ac.	1	16	8	= rent of 1 acre
			10	
	18	6	8	= rent of 10 acres
			10	
	183	6	8	= rent of 100 acres
			3	
	550	0	0	= rent of 300 acres
	18	6	8	= rent of 10 acres
	9	3	4	= rent of 5 acres
	577	10	0	= rent of 315 acres
1 ro. = ½ of 2 ro.	0	18	4	= rent of 2 ro.
5 po. = ⅛ of 1 ro.	0	9	2	= rent of 1 ro.
1 po. = ⅕ of 5 po.	0	1	1¾	= rent of 5 po.
1 po. = ⅕ of 5 po.	0	0	2¾	= rent of 1 po.
	0	0	2¾	= rent of 1 po.
	£578	19	1¼	= rent of 315 ac. 1 ro. 7 po.

(5)

	£.	s.	d.
5/7 of the estate =	1003	17	1
1/7 of the estate =	200	15	5
the whole estate =	1405	7	11
therefore, ⅕ of the estate =	281	1	7
⅖ of the estate =	562	3	2

(6) 3s. 4d. in the £ is ⅙ of any debt;

therefore, amount received = ⅙ of £3678 16s. = £613 2s. 8d.

(7) He sells $\frac{2}{7}$ of $\frac{5}{16}$ of $\frac{3}{14}$ of the estate;

therefore, $\frac{5\times 3}{7\times 8\times 14}$ of the estate $= £\frac{965}{8}$;

therefore, the estate $= £\frac{965\times 7\times 8\times 14}{5\times 3\times 8}$;

therefore, $\frac{1}{5}$ of $\frac{3}{16}$ of the estate $= £\frac{965\times 7\times 14\times 3}{5\times 3\times 5\times 16}$

$= £\frac{193\times 49}{5\times 8} = £\frac{9457}{40} = £236\frac{17}{40} = £236$ 8*s*. 6*d*.

(8) The wife earns as much as 2 children,
the man earns as much as 6 children;
therefore, $(2+6+3)\times$(what each child earns) $=$ £1 7*s*. 6*d*.;
therefore, each child earns $\frac{1}{11}$ of £1 7*s*. 6*d*. $=$ 2*s*. 6*d*.;
therefore, the man earns (2*s*. 6*d*.) $\times 6 =$ 15*s*.

(9) 25 fr. 56 cent. $=$ 2556 cent.;
therefore, 1 florin $= \frac{1}{12}$ of 2556 cent. $=$ 213 cent. $=$ 2 fr. 13 cent.

(10)

	£.	s.	d.
If 5 men in 6 weeks earn	14	5	0
1 man in 6 weeks earns	2	17	0
1 man in 1 week earns	0	9	6
4 men in 1 week earn	1	18	0

therefore, number of weeks $=$ £19 $\div$ (£1 18*s*.) $= \frac{19\times 20}{38} = \frac{20}{2} = 10$ weeks.

II.

(1) 1 franc $= \frac{1}{26}$ of £1 $= \frac{20}{26}$ of 1 shilling $= \frac{10}{13}$ of a shilling.

(2) 1 yard $= \frac{32}{35}$ metre,

1760 yards $= \frac{32\times 1760}{35}$ metres,

therefore, $\frac{2}{3}$ of $\frac{14}{9}$ of a mile $= \frac{2\times 14\times 32\times 1760}{3\times 9\times 35}$ metres

$= \frac{45056}{27}$ metres $= 1668\frac{20}{27}$ metres.

(3) For 28 cattle they pay £40;

therefore, for 1 they pay $£\frac{40}{28}$;

therefore, for 8 cattle *A* should pay $£\frac{40\times 8}{28} = £\frac{80}{7} = £11\ 8s.\ 6\frac{3}{4}d.\ \frac{3}{7}q.$

and for 9 cattle *B* pays $£\frac{40\times 9}{28} = £12\ 17s.\ 1\frac{1}{2}d.\ \frac{6}{7}q.$

and for 11 cattle *C* pays $£\frac{40\times 11}{28} = £15\ 14s.\ 3\frac{1}{4}d.\ \frac{5}{7}q.$

(4)

$$\begin{array}{r|l} 4 & 3\cdot0 \\ \hline 12 & 3\cdot75 \\ \hline 10 & \ \ \cdot3125 \\ \hline & \ \ \cdot03125 \end{array} \qquad\qquad \begin{array}{r} 12\cdot5)\ \cdot03125\ (\cdot0025 \\ \underline{250} \\ 625 \\ \underline{625} \end{array}$$

(5)

$$\begin{array}{r|rcrcrl} & £. & & s. & & d. & \\ 2\text{ ro.}=\frac{1}{2}\text{ ac.} & 111 & . & 11 & . & 4 & =\text{value of 1 acre} \\ & & & & & 9 & \\ \hline & 1004 & . & 2 & . & 0 & =\text{value of 9 acres} \\ & & & & & 5 & \\ \hline & 5020 & . & 10 & . & 0 & =\text{value of 45 acres} \\ 1\text{ ro.}=\frac{1}{2}\text{ of 2 ro.} & 55 & . & 15 & . & 8 & =\text{value of 2 ro.} \\ 20\text{ po.}=\frac{1}{2}\text{ of 1 ro.} & 27 & . & 17 & . & 10 & =\text{value of 1 ro.} \\ & 13 & . & 18 & . & 11 & =\text{value of 20 po.} \\ \hline & £5118 & . & 2 & . & 5 & =\text{value of 45 ac. 3 ro. 20 po.} \end{array}$$

(6) £60000 has to produce £2500;

therefore, £1 must produce $£\frac{2500}{60000} = £\frac{1}{24} = 10d.$

(7) Circumference of the wheel $= (5 \times 3\cdot14159)$ feet;

therefore, number of revolutions made by the wheel

$$\text{in 10 miles} = \frac{10\times 1760\times 3}{5\times 3\cdot14159} = \frac{10560}{3\cdot14159} = 3361\cdot3\ldots.$$

(8)

$$\begin{array}{rcl} s. & & d. & & £. & & s. & & d. & \\ 4 & . & 9\times 7\frac{1}{6} & = & 1 & . & 14 & . & 0\frac{1}{2} & =\text{value of wheat} \\ 5 & . & 3\times 9\frac{1}{4} & = & 2 & . & 8 & . & 6\frac{3}{4} & =\text{value of malt} \\ 2 & . & 4\times 6\frac{2}{9} & = & 0 & . & 14 & . & 6\frac{2}{9} & =\text{value of oats} \\ \hline & & & & £4 & . & 17 & . & 1\frac{17}{36} & =\text{rent.} \end{array}$$

Also, to find what he would pay in decimal coinage, we have

$$\begin{array}{r|l}
 & \quad d. \\
36\begin{cases}4\\9\end{cases} & \begin{array}{l}17{\cdot}00\\ \hline 4{\cdot}25\end{array} \\ \cline{2-2}
12 & 1{\cdot}47\dot{2} \\ \cline{2-2}
2{,}0 & 17{\cdot}12268\dot{8}5\dot{1} \\ \cline{2-2}
 & 4{\cdot}856134\dot{2}5\dot{9}
\end{array}$$

therefore, he would pay £4. 8 fl. 5 c. $6{\cdot}134\dot{2}5\dot{9}$ m.

(9) *A* can do $\frac{1}{10}$ part of the work in one hour,
B can do $\frac{1}{12}$ part of the work in one hour;
A and *B* will do $(\frac{1}{10}+\frac{1}{12})$ or $\frac{11}{60}$ in one hour;
therefore, they will complete the work in $\frac{60}{11}$ hours, or $5\frac{5}{11}$ hours.

(10) The first set in 1 hour dig $\frac{12}{16}$ of a load,
the second set in 1 hour dig $\frac{9}{15}$ of a load;
therefore, both sets in 1 hour dig $(\frac{12}{16}+\frac{9}{15})$, or $\frac{27}{20}$ of a load;
therefore, they dig 100 loads in $(100\div\frac{27}{20})$ hours,
i.e. in $\frac{2000}{27}$ hours, or $74\frac{2}{27}$ hours.

III.

(1)

$$\begin{array}{r|rcrcrcr}
 & \text{tons.} & & \text{cwt.} & & \text{qrs.} & & \text{lbs.} \\
36\begin{cases}4\\9\end{cases} & \begin{array}{r}28\\ \hline 7\end{array} & \begin{array}{c}.\\.\end{array} & \begin{array}{r}4\\ \hline 1\end{array} & \begin{array}{c}.\\.\end{array} & \begin{array}{r}3\\ \hline 0\end{array} & \begin{array}{c}.\\.\end{array} & \begin{array}{r}0\\ \hline 21\end{array} \\ \cline{2-8}
 & & & 15 & . & 2 & . & 21
\end{array}$$

	£.	s.	d.	
2 qrs. = $\frac{1}{2}$ cwt.	7	10	8	= value of 1 cwt.
			3	
	22	12	0	= value of 3 cwt.
			5	
	113	0	0	= value of 15 cwt.
14 lbs. = $\frac{1}{2}$ of 2 qrs.	3	15	4	= value of 2 qrs.
7 lbs. = $\frac{1}{2}$ of 14 lbs.	0	18	10	= value of 14 lbs.
	0	9	5	= value of 7 lbs.
	£118	3	7	= value of 15 cwt. 2 qrs. 21 lbs.

(2)

$$\begin{array}{r|l}
25 & 1{\cdot}00 \\ \cline{2-2}
12 & 8{\cdot}04 \\ \cline{2-2}
3 & 2{\cdot}67 \\ \cline{2-2}
22\begin{cases}2\\11\end{cases} & \begin{array}{l}186{\cdot}89\\ \hline 93{\cdot}445\end{array} \\ \cline{2-2}
 & 8{\cdot}495
\end{array}$$

and 8·495 chains = 8 chains, 4 chainlets, 9 links, 5 linklets.

(3) $25\frac{1}{2}$ francs $= £1 = 45$ pauls 9 baiocchi $= 45\frac{9}{10}$ pauls;

therefore, 1 franc $= \left(\frac{459}{10} \div \frac{51}{2}\right)$ pauls;

therefore, 20 francs $= \frac{459 \times 2 \times 20}{10 \times 51}$ pauls $= 36$ pauls.

(4) $£2514\frac{3}{8}$ produces $£83\frac{13}{16}$;

therefore, £1 produces $£\left(83\frac{13}{16} \div 2514\frac{3}{8}\right)$

$$= £\left(\frac{1341}{16} \times \frac{8}{20115}\right) = £\,\frac{1}{30} = 8d.;$$

and, therefore, $£115\frac{5}{8}$ pays $\left(115\frac{5}{8} \times 8\right)d. = 925d. = £3\ 17s.\ 1d.$

(5)
$$\begin{array}{llll}
\overset{£.}{1000} & \text{gains } \overset{£.}{90} & \text{in } 7 \text{ months,} & \\
1000 & \ldots\ldots\ 1 & \ldots\ \frac{7}{90} \text{ months,} & \\
1 & \ldots\ldots\ 1 & \ldots\ \frac{7 \times 1000}{90} \text{ months,} & \\
315 & \ldots\ldots\ 1 & \ldots\ \frac{7 \times 100}{9 \times 315} \text{ months,} & \\
315 & \ldots\ldots\ 20\frac{1}{4} & \ldots\ \frac{100}{9 \times 45} \times \frac{81}{4} \text{ months} = \frac{20}{4} \text{ months} = 5 \text{ months.} &
\end{array}$$

(6)
$$\begin{array}{r|rcrcll}
 & £. & & s. & & d. & \\
14 \text{ lbs.} = \frac{1}{2} \text{ qr.} & 4 & . & 6 & . & 0\frac{1}{2} & = \text{price of 1 qr.} \\
 & & & & & 5 & \\
\hline
 & 21 & . & 10 & . & 2\frac{1}{2} & = \text{price of 5 qrs.} \\
 & & & & & 3 & \\
\hline
 & 64 & . & 10 & . & 7\frac{1}{2} & = \text{price of 15 qrs.} \\
2 \text{ lbs.} = \frac{1}{7} \text{ of 14 lbs.} & 2 & . & 3 & . & 0\frac{1}{4} & = \text{price of 14 lbs.} \\
 & 0 & . & 6 & . & 1\frac{3}{4} & = \text{price of 2 lbs.} \\
\hline
 & £66 & . & 19 & . & 9\frac{1}{2} & = \text{price of 3 cwt. 3 qrs. 16 lbs.}
\end{array}$$

(7) Area of walls $= 2\,(\text{length} + \text{breadth}) \times \text{height}$

$$= (2 \times 35 \times 12) \text{ sq. ft.} = \frac{840}{9} \text{ sq. yds.};$$

therefore, cost $= \left(\frac{280}{3} \times 2\frac{1}{2}\right)d. = \frac{280 \times 5}{3 \times 2}d.$

$$= \frac{700}{3}d. = 233\frac{1}{3}d. = 19s.\ 5\frac{1}{4}d.\ \frac{1}{3}q.$$

(8) Average length of year $= \left(365 + \frac{97}{400}\right)$ days

$$= \left(365 + \frac{\cdot 97}{4}\right) \text{days} = 365{\cdot}2425 \text{ days.}$$

(9) 15 horses + 148 sheep eat as much as

$(3 \times 84 + 148)$ sheep, or 400 sheep;

10 horses + 132 sheep eat as much as

$(2 \times 84 + 132)$ sheep, or 300 sheep.

Then 400 sheep in 1 day cost $£\dfrac{75\frac{3}{4}}{9}$,

$$1 \;\ldots\ldots\ldots\; 1 \;\ldots\ldots\ldots\; £\frac{303}{9 \times 4 \times 400},$$

$$1 \;\ldots\ldots\ldots\; 8 \;\ldots\ldots\ldots\; £\frac{101 \times 8}{3 \times 4 \times 400},$$

$$300 \;\ldots\ldots\ldots\; 8 \;\ldots\ldots\ldots\; £\frac{101 \times 2 \times 300}{3 \times 400} = £\frac{101}{2} = £50\ 10s.$$

(10) *A* does $\frac{1}{6}$ of the work in 1 hour,

B does $\frac{1}{12}$ of the work in 1 hour,

A, *B*, and *C* do $\dfrac{1}{2\frac{1}{2}}$ or $\frac{2}{5}$ of the work in 1 hour;

therefore, *C* does in 1 hour $(\frac{2}{5} - \frac{1}{6} - \frac{1}{12})$ or $\frac{3}{20}$,

in 5 hours *C* does $\frac{3}{4}$ of the work,

and in 9 hours *B* does $\frac{9}{12}$, *i.e.* $\frac{3}{4}$ of the work.

IV.

(1) $729 \times 37 = 26973$.

(2) $\frac{1}{5}$ of $1s. + \frac{2}{7}$ of $5s. + \frac{4}{9}$ of $21s. = \left(\frac{1}{5} + \frac{10}{7} + \frac{28}{3}\right)s. = \frac{1151}{105}s.$;

therefore, fraction $= \dfrac{1151}{105 \times 20 \times 25} = \dfrac{1151}{525 \times 100}$

$$= \frac{11\cdot51}{525} = \frac{2\cdot302}{105} = \frac{\cdot4604}{21} = \frac{\cdot1534\dot{6}}{7} = \cdot0219\dot{2}3809\dot{5}.$$

(3) The capital put in by both persons $= £(500 + 850) = £1350$;

therefore, $\dfrac{500}{1350}$ = first person's share of the profit;

therefore, first share $= \frac{10}{27}$ of $£375 = £\dfrac{1250}{9} = £138\ 17s.\ 9\frac{1}{3}d.$,

second share $= £375 - £138\ 17s.\ 9\frac{1}{3}d. = £236\ 2s.\ 2\frac{2}{3}d.$

(4) Area of base $=\frac{1}{2}$ circumference $\times \frac{1}{2}$ diameter

$$=\tfrac{1}{2}\times 3\tfrac{1}{7}\text{ diameter}\times\tfrac{1}{2}\text{ diameter}=\tfrac{1}{2}\times 3\tfrac{1}{7}\times 2\text{ ft.}\times\tfrac{1}{2}\times 2\text{ ft.}$$

$$=\frac{1\times 22\times 2\times 2}{2\times 7\times 2}\text{ sq. ft.}=\frac{22}{7}\text{ sq. ft.}$$

therefore, content of column $=\left(\frac{22}{7}\times 15\right)$ cub. ft.;

therefore, cost $=\left(\frac{22\times 15\times 31}{7\times 2}\right)$*s.* $=$ £36 10*s.* 8½*d.* $\frac{2}{7}$*q.*

(5) The men do the work in (12×6) hours $=72$ hours;

therefore, if the day is 8 hours long,

they will take $\left(\frac{72}{8}\right)$ days $=9$ days.

(6)

$$\begin{array}{lll}
\textit{s.}\quad\textit{d.} & & \text{£.}\quad\textit{s.}\quad\textit{d.} \\
4\ .\ 3 & \times 10 = & 2\ .\ \ 2\ .\ 6 \quad =\text{value of tea} \\
1\ .\ 3\frac{1}{2} & \times 18 = & 1\ .\ \ 3\ .\ 3 \quad =\text{value of coffee} \\
0\ .\ 4\frac{1}{4} & \times 23 = & 0\ .\ \ 8\ .\ 1\frac{3}{4} \quad =\text{value of sugar} \\
0\ .\ 7\frac{3}{4} & \times 16 = & 0\ .\ 10\ .\ 4 \quad =\text{value of candles} \\
 & 14\left\{\begin{array}{l}2\\7\end{array}\right. & \begin{array}{|l}\hline 4\ .\ 4\ .\ 2\frac{3}{4}\\ \hline 2\ .\ 2\ .\ 1\frac{3}{8}\\ \hline\end{array}\quad =\text{entire cost} \\
 & & \ 0\ .\ 6\ .\ 0\frac{11}{56} = \text{share of each person.}
\end{array}$$

(7) $(2375\frac{3}{4}\times 40)$*d.* $=95030$*d.* $=$ £395 19*s.* 2*d.*,

and 2*s.* 3⅞*d.* $\times 1000000=\left(\frac{223}{8}\times 1000000\right)$*d.*

$=(27875000)$*d.* $=$ £116145 16*s.* 8*d.*

(8) Area covered in each revolution $=(6\frac{1}{2}\times 2\frac{1}{4})$ sq. ft.,

area covered in all the revolutions

$$=\left(10\times 12\times\frac{13}{2}\times\frac{9}{4}\right)\text{ sq. ft.}=(195\times 9)\text{ sq. ft.}=195\text{ sq. yds.}$$

(9) *C*'s share $=\frac{2}{3}$ *B*'s share, *A*'s share $=\frac{5}{4}$ *B*'s share;

therefore, $\frac{5}{4}$ *B*'s share $+$ *B*'s share $+\frac{2}{3}$ *B*'s share $=$ £1400;

therefore, $\frac{35}{12}$ *B*'s share $=$ £1400;

therefore, *B*'s share $=$ £ $\frac{1400\times 12}{35}=$ £480,

C's share $=\frac{2}{3}$ of £480 $=$ £320,

A's share $=\frac{5}{4}$ of £480 $=$ £600.

(10) Take 3 gallons of the mixture.

These consist of 2 parts brandy and 1 part rum,

and they cost the merchant (£4 10*s.* + £1 1*s.*) or £5 11*s.*

He then sells them for £2 5*s.* × 3, or £6 15*s.*;

therefore, he gains on 3 gallons of the mixture £1 4*s.*

therefore, on each gallon he gains $\frac{24}{3}$ *s.* = 8*s.*

V.

(1) 550974 ÷ 1472 = 374 with remainder 446.

(2) $\frac{6}{45}$, $\frac{5}{7}$, $\frac{9}{35}$, L.C.D. is 315,

and the fractions become

$$\frac{6\times7}{45\times7},\ \frac{5\times45}{7\times45},\ \frac{9\times9}{35\times9},\ \text{or}\ \frac{42}{315},\ \frac{225}{315},\ \frac{81}{315},$$

and their sum $= \frac{42+225+81}{315} = \frac{348}{315} = 1\frac{11}{105}$.

(3) 1 oz. Avoird. $= \frac{7000}{16}$ grs. Troy $= \frac{7000}{16\times20\times24\times12\times40}$ of 40 lbs. Troy

$$= \frac{7000}{16\times20\times24\times12\times40} \text{ of 1869 sovereigns}$$

$$= \frac{70\times1869}{16\times2\times24\times12\times4} \text{ sovereigns}$$

$$= \frac{21805}{6144} \text{ sovereigns} = 3\tfrac{3373}{6144} \text{ sovereigns.}$$

(4) Value for 1 year = (27500000 × 45)*s.*,

value for $\frac{1}{4}$ year $= £\frac{27500000\times45}{4\times20} = £(1718750\times9) = £15468750$.

(5) The first set in 1 hour mow $\frac{4}{3}$ acres,

the second set in 1 hour mow $\frac{8}{5}$ acres;

therefore, together in 1 hour they mow $\frac{44}{15}$ acres;

therefore, they mow 44 acres in 15 hours,

and 11 acres in $(\frac{15}{4})$ hours, or $3\frac{3}{4}$ hours.

(6) (1) number of cubic feet of water = area of base × depth

$$=\left(\frac{1344}{144}\times\frac{15}{4}\right)\text{cub. ft.} = 35 \text{ cub. ft.},$$

(2) depth of cistern $= \dfrac{\text{cubic content}}{\text{area of base}} = \dfrac{35\times 1728}{1088}$ in. = 4 ft. $7\frac{10}{17}$ in.

(7) He does the work in ($8\frac{1}{2}\times 6$) hours, or 51 hours;

therefore, if he has to finish it in 5 days,

he must work each day $\dfrac{51}{5}$ hours, or 10 hours 12 min.

(8) 1 man $= \dfrac{11}{7}$ woman,

11 men + 7 women $= \left(\dfrac{121}{7}+7\right)$ women $= \dfrac{170}{7}$ women.

Now, by the question,

1 woman does the work in (11×17) days;

therefore, 170 women do the work in $\left(\dfrac{11\times 17}{170}\right)$ days;

therefore, $\dfrac{170}{7}$ women do the work in $\dfrac{11\times 17\times 7}{170}$ days;

therefore, the time required is $\dfrac{77}{10}$ days, or $7\frac{7}{10}$ days.

(9) Area of doors $= 2\,(8\times 3\frac{3}{4})$ sq. ft. = 60 sq. ft.,

area of 1 window = (5×7) sq. ft. = 35 sq. ft.,

area of 2 windows = $2\,(5\times 4)$ sq. ft. = 40 sq. ft.;

therefore, area of the parts not requiring paper = 135 sq. ft.

Again, area of walls $= 2\,(20\frac{1}{2}+15\frac{1}{2})$ ft. × 16 ft.

$= (2\times 36\times 16)$ sq. ft. = 1152 sq. ft.;

therefore, area of paper required = (1152 − 135) sq. ft.;

therefore, cost at 10*d.* a sq. yd. $= \dfrac{1017\times 10}{9}$ *d.* = 1130*d.* = £4 14*s.* 2*d.*

(10) Debts amount to £1215 19*s.* 2*d.*, or £$1215\frac{23}{24}$,

and the estate is worth £$911\frac{155}{160}$.

If the bankrupt has £1, he pays $\frac{1}{1215\frac{23}{24}}$ of debts,

as he has £$911\frac{155}{160}$, he pays $\frac{911\frac{155}{160}}{1215\frac{23}{24}}$ of debts,

and this fraction reduced becomes $\frac{3}{4}$;

therefore, he pays 15*s.* in the £.

		£.	*s.*	*d.*		£.	*s.*	*d.*
Also *A* receives	$\frac{3}{4}$ of	515	12	6	or	386	14	$4\frac{1}{2}$
B	$\frac{3}{4}$ of	407	0	0	or	305	5	0
C	$\frac{3}{4}$ of	293	6	8	or	220	0	0

VI.

(1) £10 17*s.* $6\frac{3}{4}$*d.* × 8764 = £95335 17*s.* 9*d.*

	£.	*s.*	*d.*	
10*s.* = $\frac{1}{2}$ of £1	8764	0	0	= value at £1 each
			10	
	87640	0	0	= value at £10 each
5*s.* = $\frac{1}{2}$ of 10*s.*	4382	0	0	= value at 10*s.* each
1*s.* = $\frac{1}{5}$ of 5*s.*	2191	0	0	= value at 5*s.* each
1*s.* = $\frac{1}{5}$ of 5*s.*	438	4	0	= value at 1*s.* each
6*d.* = $\frac{1}{2}$ of 1*s.*	438	4	0	= value at 1*s.* each
$\frac{3}{4}$*d.* = $\frac{1}{8}$ of 6*d.*	219	2	0	= value at 6*d.* each
	27	7	9	= value at $\frac{3}{4}$*d.* each
	£95335	17	9	= value at £10 17*s.* $6\frac{3}{4}$*d.* each.

(2) For every 11*s.* in his assets he owes 20*s.*;

therefore, his debts = $\frac{20}{11}$ of his assets = $\frac{20}{11}$ of 10846*s.*

= £ $\frac{10846}{11}$ = £986.

(3) True length = $10\frac{1}{2}$ yds. − ($10\frac{1}{2} \times \frac{2}{3}$)in. = $10\frac{1}{2}$ yds. − 7 in. = 10 yds. 11 in.

(4) 420 thalers = (420 × 3) shillings

= £ $\frac{420 \times 3}{20}$ = $\frac{420 \times 3 \times 24}{20}$ francs = 1512 francs.

(5) 6 oz. of almonds cost $\frac{6 \times 10}{16}$ *d.* = $3\frac{3}{4}$*d.*,

$\frac{3}{4}$ lb. of raisins cost $\frac{3 \times 11}{4}$ *d.* = $8\frac{1}{4}$*d.*;

therefore, whole cost = ($3\frac{3}{4} + 8\frac{1}{4}$)*d.* = 1 shilling.

(6)

$$\begin{array}{r|rrrl}
 & £. & s. & d. & \\
2\text{ qrs.}=\frac{1}{2} & 6\ . & 0\ . & 0 & =\text{price of 1 cwt.}\\
 & & & 5 & \\ \cline{2-4}
 & 30\ . & 0\ . & 0 & =\text{price of 5 cwt.}\\
1\text{ qr.}=\frac{1}{2} & 3\ . & 0\ . & 0 & =\text{price of 2 qrs.}\\
14\text{ lbs.}=\frac{1}{2} & 1\ . & 10\ . & 0 & =\text{price of 1 qr.}\\
 & 0\ . & 15\ . & 0 & =\text{price of 14 lbs.}\\ \cline{2-4}
\multicolumn{1}{r}{} & 35\ . & 5\ . & 0 & =\text{price of 5 cwt. 3 qrs. 14 lbs.}\\
\multicolumn{1}{r}{} & 7\ . & 16\ . & 8 & \\ \cline{2-4}
\multicolumn{1}{r}{} & £27\ . & 8\ . & 4 & =\text{reduced price.}
\end{array}$$

Now 5 cwt. 3 qrs. 14 lbs = 658 lbs., and £27 8*s.* 4*d.* = 6580*d.*;

therefore, price of each lb. $= \dfrac{6580}{658}\,d. = 10d.$

(7)

	£.	s.	d.
The sugar costs him	30 .	0 .	0
he pays for expenses	0 .	12 .	6
he has to gain	15 .	6 .	3
therefore, he must sell it for	45 .	18 .	9

Now 10 cwt. 3 qrs. 21 lbs. = 1225 lbs., and £45 18*s.* 9*d.* = 11025*d.*

therefore, price of each lb. $= \dfrac{11025}{1225}\,d. = 9d.$

(8) Area of walls $= 2 \times (20\text{ ft.} + 16\tfrac{1}{2}\text{ ft.}) \times 12\text{ ft.} = (73 \times 12)$ sq. ft.;

therefore, quantity of paper required $= \dfrac{73 \times 12}{9}$ sq. yds.

Now $(12 \times \frac{3}{4})$ sq. yds., or 9 sq. yds. cost 54*d.*;

therefore, 1 sq. yd. costs 6*d.*;

therefore, cost of paper $= \dfrac{73 \times 12 \times 6}{9}\,d. = (73 \times 8)d. = £2\ 8s.\ 8d.$

(9) Length of pole $= (35 \times 12)$ in. $= 420$ in.

Now in 24 hrs. the snail creeps up 15 in.;

therefore, in (24×26) hrs. the snail creeps up (15×26) in., or 390 in.;

therefore, he has $(420 - 390)$ in., or 30 in. to get up.

And he goes over 1 in. in $\dfrac{12}{31}$ hrs.,

and over 30 in. in $\dfrac{12 \times 30}{31}$ hrs.;

therefore, he reaches the top in $\left(24 \times 26 + \dfrac{12 \times 30}{31}\right)$ hrs.,

or in $(624 + 11\frac{19}{31})$ hrs. $= 635\frac{19}{31}$ hrs.

(10)

	£.	s.	d.	
Wages of 3 foremen weekly =	6	6	0	
.... 10 shopmen ...... =	10	10	0	
.... 5 assistants ...... =	4	7	6	
total amount of wages =	21	3	6	
weekly profits =	54	6	5	
difference =	33	2	11	
			10	
	331	9	2	for 10 weeks
			5	
	1657	5	10	for 50 weeks
	66	5	10	for 2 weeks
annual income =	1723	11	8	for 1 year
annual outgoings =	723	11	8	
net profit =	1000	0	0	

VII.

(1) $\frac{2}{3}$ of $\frac{1}{4}$ of 13 guineas $= \frac{2\times 13\times 21}{3\times 4}s. = \frac{13\times 7}{2}s. = \frac{91}{2}s.$ £2 5*s*. 6*d*.

Again, £2 5*s*. 6*d*. = 91 sixpences, and £237 10*s*. = 9500 sixpences;

therefore, fraction $= \frac{91}{9500} = \frac{\cdot 91}{95} = \cdot 0095\ldots.$

(2) £5 6*s*. 3¼*d*. = 5101*q*., £85 0*s*. 4*d*. = 81616*q*.;

therefore, number $= \frac{81616}{5101} = 16.$

Again, (4 + 2 + 1) times the third part = £34 13*s*.

or 7 times the third part = £34 13*s*.

therefore, third part = £4 19*s*.,

second part = £9 18*s*.,

first part = £19 16*s*.

(3)

days.	
365·25	= length of civil year
365·242264	= true length of year
·007736	= annual defect.

Since, therefore, $\frac{7736}{1000000}$ of 1 day is the defect each year,

number of years required $= \frac{1000000}{7736} = \frac{125000}{967} = 129\frac{257}{967}.$

(4) 1 man mows 300 acres in (15×17) days,

1 man mows 1 acre in $\frac{15 \times 17}{300}$ days,

27 men mow 167 acres in $\frac{15 \times 17 \times 167}{300 \times 27}$ days $= \frac{2839}{540}$ days $= 5\frac{139}{540}$ days.

(5) 6 times the work may be done in 12 days by 120 men;

therefore, 6 times the work may be done in $\frac{12}{10}$ days by 1200 men.

(6) $\frac{3}{4}$ of $\frac{4}{5}$ of $\frac{1}{3} = \frac{1}{5}$;

	£.	s.	d.
therefore, value of my share was	1032	4	9
and $\frac{1}{6}$ of the ship's value is	860	3	$11\frac{1}{2}$
therefore, value of part remaining is	172	0	$9\frac{1}{2}$

(7) Since £900 has £675 to meet it,

£1 has £ $\frac{675}{900}$, or £$\frac{3}{4}$ to meet it,

also claim of third creditor will be

£(900 − 125 − 375), or £400;

therefore, he receives $\frac{3}{4}$ of £400, or £300.

(8) Area of first cistern $= (13\frac{1}{3} \times 8 \times 5\frac{1}{4})$ cub. ft.

$= \frac{40 \times 8 \times 21}{3 \times 4}$ cub. ft. $= 560$ cub. ft.,

area of second cistern $= (7 \times 6\frac{2}{3} \times 6)$ cub. ft.

$= \left(\frac{7 \times 20 \times 6}{3}\right)$ cub. ft. $= 280$ cub. ft.;

therefore, first content = twice second content.

(9) 60*s*. × number of workmen in first class = wages of first class,

63*s*. × number of workmen in first class = wages of second class,

154*s*. × number of workmen in first class = wages of third class;

therefore, 277*s*. × number of workmen in first class = wages of all

= £96 19*s*. = 1939*s*.

therefore, number of workmen in first class $= \frac{1939}{277} = 7$;

therefore, number of workmen $= 7 + 14 + 77 = 98$.

(10)

£.	francs.		francs.	cents.
1	$=25\frac{1}{4}$	=	25	25
400	$=(10000+100)$	=	10100	0
5		=	126	25
$\frac{1}{3}$		=	8	$41\frac{2}{3}$
therefore, 405 6*s*. 8*d*.		=	10234	$66\frac{2}{3}$

VIII.

(1) 13 lbs. 9 oz. = 165 oz.

	£.	*s*.	*d*.	
2 dwts. = $\frac{1}{10}$ of 1 oz.	3	5	0	
			10	
	32	10	0	= cost of 10 oz.
			10	
	325	0	0	= cost of 100 oz.
	195	0	0	= cost of 60 oz.
	16	5	0	= cost of 5 oz.
	536	5	0	= cost of 165 oz.
1 dwt. = $\frac{1}{2}$ of 1 dwt.	0	6	6	= cost of 2 dwts.
	0	3	3	= cost of 1 dwt.
	£536	14	9	= value required.

(2) £1 11*s*. $6\frac{1}{4}$*d*. = 1513*q*., 2 florins = 96*q*.;

therefore, number $=\dfrac{1513}{96}=15\frac{73}{96}$.

(3) 3 kreutzers = 1 penny,

1 kreutzer $=\dfrac{1}{3\times 240}$ of £1,

5 kreutzers $=\dfrac{5\times 12}{3\times 240}$ of a gulden $=\dfrac{1}{12}$ of a gulden.

(4) 12*s*. 4*d*. is $\frac{37}{60}$ of £1;

therefore, he first receives $\frac{37}{60}$ of £296 = £182 10*s*. 8*d*.,

the deficiency is then £113 9*s*. 4*d*.;

and since 3*s*. 9*d*. is $\frac{3}{16}$ of £1,

he next receives $\frac{3}{16}$ of £113 9*s*. 4*d*. = £21 5*s*. 6*d*.;

therefore, in all he receives £203 16*s*. 2*d*.

(5) 12 ft. $4\frac{1}{2}$ in. $= 148\frac{1}{2}$ in. $= \frac{297}{2}$ in.,

1 mile $= (1760 \times 3 \times 12)$ in.;

$$\text{therefore, fraction} = \frac{297}{1760 \times 3 \times 12 \times 2} = \frac{9 \times 11 \times 3}{11 \times 160 \times 3 \times 12 \times 2} = \frac{3}{1280},$$

$$\text{and } \frac{3}{1280} = \frac{\cdot375}{160} = \frac{\cdot046875}{20} = \cdot00234375.$$

(6) The edition will cover $(29040 \times 3 \times \frac{7}{2} \times 2)$ sq. ft. $= (29040 \times 21)$ sq. ft.,

one acre $= (4840 \times 9)$ sq. ft.;

$$\text{therefore, number of acres} = \frac{29040 \times 21}{4840 \times 9} = \frac{9680 \times 7}{4840} = 2 \times 7 = 14.$$

(7) Income-tax $= (200 \times 7)d. = 2800$ halfpence,

and he has to save 3 halfpence on each lb.;

$$\text{therefore, number of pounds of sugar} = \frac{2800}{3} = 933\tfrac{1}{3} \text{ lbs.};$$

therefore, he must use 8 cwt. $37\frac{1}{3}$ lbs. of sugar.

(8) *B*'s work in 24 hours $=$ *A*'s work in 20 hours;

therefore, *A* could do $\frac{1}{2}$ the work in $(12 + 20)$ hours, or in 32 hours;

therefore, *C* does $\frac{1}{2}$ the work in $(\frac{9}{5} \times 32)$ hours, or in $57\frac{3}{5}$ hours.

(9) $\cdot\dot{3}$ of £1 $= \frac{3}{9}$ of £1 $= \frac{1}{3}$ of £1 $= 6s.\ 8d.$

(10)

$$\begin{array}{rr|rrrl}
 & & \pounds. & s. & d. & \\
\pounds3000 \times 52 = & & 156000\ . & 0\ . & 0 & \text{annual earnings} \\
\pounds775\ 14s.\ 2d. \times 52 = & & 40336\ . & 16\ . & 8 & \text{annual expenses} \\
\hline
 & 10 & 115663\ . & 3\ . & 4 & \\
 & & 11566\ . & 6\ . & 4 & \\
\hline
 & & 104096\ . & 17\ . & 0 & \\
 & & 24141\ . & 13\ . & 8 & \\
\hline
 & & \pounds79955\ . & 3\ . & 4 & \text{net profit.}
\end{array}$$

IX.

(1) $\frac{9275}{371} + \frac{1522842}{719} = 25 + 2118 = 2143.$

(2) $\frac{2}{5} = \frac{2\cdot0}{5} = \cdot4,$

$$\frac{75}{1875} = \frac{15}{375} = \frac{3}{75} = \frac{1}{25} = \frac{1\cdot00}{25} = \cdot04.$$

(3) $\frac{1}{3}-\frac{1}{6}-\frac{1}{24}=\frac{8-4-1}{24}=\frac{3}{24}=\frac{1}{8}$;

and since $8=2\times 2\times 2$, the fraction will become a finite decimal.

Again, $\dfrac{\frac{1}{3}+\frac{1}{4}}{\frac{1}{2}+\frac{1}{3}}$ of £1 $=\dfrac{\frac{7}{12}}{\frac{5}{6}}$ of £1 $=\dfrac{7\times 6}{5\times 12}$ of £1 $=\frac{7}{10}$ of £1 $=14s.$

(4) $(\frac{2}{3}-\frac{1}{2})$ of the term $=13\frac{1}{3}$ days;

therefore, $\frac{1}{6}$ of the term $=13\frac{1}{3}$ days;

therefore, the term $=(13\frac{1}{3}\times 6)$ days $=80$ days.

(5)

$$\begin{array}{r|l} 4 & 2{\cdot}0 \\ \hline 12 & 6{\cdot}5 \\ \hline 2{,}0 & 17{\cdot}541\dot{6} \\ \hline & £19{\cdot}87708\dot{3} \end{array}$$

Ans. £19 8 f. 7 c. 7 m. with $\cdot 08\dot{3}$ m. over,

and $\cdot 08\dot{3}$ m. $=\frac{83-8}{900}$ m. $=\frac{75}{900}$ m. $=\frac{1}{12}$ m.

(6) Area of field $=7$ ac. 1 ro. 15 po. $=46064700$ sq. in.,

length of field $=453$ yds. 2 ft. 3 in. $=16335$ in.;

therefore, breadth $=\frac{46064700}{16335}$ in. $=2820$ in. $=78$ yds. 1 ft.

(7)

$$\begin{array}{rcl} & s.\ \ \ d. & \\ 3d.\times 2\frac{1}{6}= & 0\ .\ 6\frac{1}{2} & =\text{price of milk} \\ 2s.\times \frac{1}{12}= & 0\ .\ 2\phantom{\frac{1}{2}} & =\text{price of lemon} \\ 1s.\times \frac{1}{8}= & 0\ .\ 1\frac{1}{2} & =\text{price of 2 eggs} \\ 13s.\times \frac{1}{8}= & 1\ .\ 7\frac{1}{2} & =\text{price of rum} \\ 24s.\ 8d.\times \frac{1}{16}= & 1\ .\ 6\frac{1}{2} & =\text{price of brandy} \\ \hline & 4\ .\ 0\phantom{\frac{1}{2}} & =\text{whole cost.} \end{array}$$

(8) The English hen while eating a pint of barley lays 10 eggs; and these are equivalent to 15 Cochin China eggs. Consequently the English hen lays 15 eggs to the other hen's 12 eggs, and is the more economical layer.

(9) $(20 \times 3 \times 1\frac{1}{2} \times 4)$ cub. ft. $= 360$ cub. ft. $=$ content of first trench,

$(30 \times 3 \times 2\frac{1}{4} \times 5)$ cub. ft. $= \frac{2025}{2}$ cub. ft. $=$ content of second trench;

therefore, since $\overset{\text{cub. ft.}}{360}$ are dug in $\overset{\text{hours.}}{30}$ by $\overset{\text{men.}}{72}$

$$\begin{array}{lrl}
1 & \ldots\ldots\ldots\ 30 & \text{by } \dfrac{72}{360} \\[2ex]
1 & \ldots\ldots\ldots\ 1 & \text{by } \dfrac{72 \times 30}{360} \\[2ex]
1 & \ldots\ldots\ldots\ 135 & \text{by } \dfrac{72 \times 30}{135 \times 360} \\[2ex]
\dfrac{2025}{2} & \ldots\ldots\ldots\ 135 & \text{by } \dfrac{72 \times 30 \times 2025}{2 \times 135 \times 360}
\end{array}$$

therefore, number of men $= \frac{3 \times 2025}{135} = \frac{2025}{45} = \frac{405}{9} = 45.$

(10) Wages of men $= £(420 \times 3) = £1260$;

therefore, wages of boys $= £(1500 - 1260) = £240$;

therefore, number of boys $= \frac{240 \times 20}{30} = 80 \times 2 = 160.$

X.

(1) $\frac{3}{5} + {\cdot}061 = {\cdot}6 + {\cdot}061 = {\cdot}661$;

${\cdot}02 - {\cdot}003 = {\cdot}017$;

${\cdot}0672 \div {\cdot}006 = 11{\cdot}2.$

(2) $\frac{2}{3} \text{ of } \frac{7}{11} - \frac{1}{2} \text{ of } \frac{5}{6} = \frac{14}{33} - \frac{5}{12} = \frac{1}{132},$

and $\frac{1}{132} \times \left(\frac{3}{7} \text{ of } \frac{5}{8}\right) = \frac{3 \times 5}{132 \times 7 \times 8} = \frac{5}{2464}.$

(3)

$$\begin{array}{r|l}
4 & \underline{2{\cdot}0} \\
12 & \underline{7{\cdot}5} \\
2{,}0 & \underline{10{\cdot}625} \\
 & £25{\cdot}53125
\end{array}$$

therefore, £25 10*s*. 7½*d*. $=$ £25 5 fl. 3 c. 1¼ m. $=$ 255 fl. 3 c. 1¼ m.

(4)

$$\begin{array}{lcl} & \text{men. days.} & d. \\ \text{Since} & 6 \text{ in } \frac{15}{2} \text{ earn} & 1755 \\ & 1 \text{ in } \frac{15}{2} \text{ earns} & \frac{1755}{6} \\ & 1 \text{ in } 1 \text{ earns} & \frac{1755\times 2}{15\times 6} \\ & 10 \text{ in } 1 \text{ earn} & \frac{1755\times 2\times 10}{15\times 6} \\ & 10 \text{ in } \frac{47}{4} \text{ earn} & \frac{1755\times 2\times 10\times 47}{15\times 6\times 4} \end{array}$$

therefore, earnings $= \frac{1755\times 47}{18} d. = \frac{195\times 47}{2} d. = £19\ 1s.\ 10\frac{1}{2}d.$

(5) $£72 = (72\times 20\times 12)d.$, $2s.\ 2d. = 26d.$

therefore, number of yards $= \frac{72\times 20\times 12}{26} = \frac{8640}{13} = 664\frac{8}{13}.$

(6) Gas consumed in 1 hour $= (10\times 4\times 60\times 60)$ cub. in.

therefore, cost $= \frac{10\times 4\times 60\times 60\times 6}{1728\times 1000} s. = \frac{6\times 6\times 6}{432} s. = \frac{216}{432} s. = \frac{1}{2} s. = 6d.$

(7)

$$\begin{array}{rcrcrl} £. & & s. & & d. & \\ 0 & . & 7 & . & 8 & = \text{price of 1 bushel} \\ & & & & 8 & \\ \hline 3 & . & 1 & . & 4 & = \text{price of 1 quarter} \\ & & & & 8 & \\ \hline 24 & . & 10 & . & 8 & = \text{price of 8 quarters} \\ 1 & . & 18 & . & 4 & = \text{price of 5 bushels} \\ 0 & . & 3 & . & 10 & = \text{price of 2 pecks} \\ 0 & . & 1 & . & 11 & = \text{price of 1 peck} \\ \hline £26 & . & 14 & . & 9 & = \text{price of 8 qrs. 5 bus. 3 pks.} \end{array}$$

Also 8 qrs. 6 bush. 2 pecks $= 70\frac{1}{2}$ pecks;

therefore, price $= (423 \div 70\frac{1}{2})s. = \frac{423\times 2}{141} s. = (3\times 2)s. = 6s.$

(8) Area of wall $= (15\frac{2}{3}\times 11\frac{1}{4})$ sq. ft. $= \left(\frac{47\times 45}{3\times 4\times 9}\right)$ sq. yds.;

therefore, length of paper required

$$= \frac{47\times 45\times 4}{3\times 4\times 9\times 3} \text{yds.} = \frac{47\times 5}{9} \text{ yds.} = 26\frac{1}{9} \text{ yds.} = 26 \text{ yds. } 4 \text{ in.}$$

(9) Area of parallelopiped $=(222\times 63\times 36)$ cub. in.,
area of cube $=(11\times 11\times 11)$ cub. in.;
therefore, value of wood

$$=\frac{222\times 63\times 36\times 42}{11\times 11\times 11}d.=\frac{21146722}{1331}d.=£66\ 3s.\ 11\tfrac{1125}{1331}d.$$

(10)

$$\begin{array}{llll} & \text{men.} & \text{cub. yds.} & \text{hours.} \\ \text{Since} & 36 \text{ dig} & 72\times 18\times 12 & \text{in } 8\times 16, \\ & 1 \text{ digs} & 1 & \text{in } \dfrac{8\times 16\times 36}{72\times 18\times 12}, \\ & 32 \text{ dig} & 64\times 27\times 18 & \text{in } \dfrac{8\times 16\times 36\times 64\times 27\times 18}{32\times 72\times 18\times 12}; \end{array}$$

therefore, number of hours $=\dfrac{8\times 16\times 27\times 18}{18\times 12}=2\times 16\times 9$;

therefore, number of days $=\dfrac{2\times 16\times 9}{12}=2\times 4\times 3=24.$

XI.

(1) $\frac{11}{133}=\cdot\dot{0}8270676691729323\dot{3}$,
and value at £300 the unit $=£24\ 16s.\ 2\tfrac{3}{4}d.\ \tfrac{73}{133}q.$

(2) If £1 pays a rate of 8*d*,
£3070 pay a rate of $(3070\times 8)d.$;
therefore, average charge per acre $=\dfrac{3070\times 8}{2456}d.=10d.$

(3) If $2\tfrac{1}{2}$ lbs. cost 10*d*., 1 lb. will cost 4*d*.,
also 2 tons 16 cwt. 17 lbs. $=6289$ lbs.;
therefore, price required $=(6289\times 4)d.=£104\ 16s.\ 4d.$

(4) It must be sold for £7 14*s*., or 154 shillings;
therefore, price per lb. $=\dfrac{154}{112}s.=\dfrac{22}{16}s.=\dfrac{11}{8}s.=1s.\ 4\tfrac{1}{2}d.$

(5) $\cdot 000035511\dot{3}\dot{6}=\dfrac{3551136-35511}{99000000000}$;

therefore, value in inches $=\dfrac{3515625\times 1760\times 3\times 12}{99000000000}$ in.

$$=\frac{3515625\times 160\times 4}{1000000000}\text{in.}=\frac{2250000000}{1000000000}\text{in.}=2\cdot 25\text{ in.}=2\tfrac{1}{4}\text{ in.}$$

(6) $5s. = 60d.$ and $2\frac{2}{5}d. = 2{\cdot}4d.$;

therefore, $5s. = \dfrac{60}{2{\cdot}4} = 25$, $2s.\ 6d. = \frac{1}{2}$ of $5s. = 12{\cdot}5$, $1s. = \frac{1}{5}$ of $5s. = 5$,

$6d. = \frac{1}{2}$ of $1s. = 2{\cdot}5$, $4d. = \frac{1}{3}$ of $1s. = 1{\cdot}\dot{6}$, $3d. = \frac{1}{4}$ of $1s. = 1{\cdot}25$.

Also, $\frac{1}{10}$ of $2\frac{2}{5}d. = \frac{12}{50}d. = \frac{6}{25}d.$;

therefore, in this unit of money one halfpenny $= \dfrac{\frac{1}{2}}{\frac{6}{25}} = \frac{25}{12} = 2{\cdot}08\dot{3}.$

(7) $4s.\ 3\frac{3}{5}d. = 5{\cdot}42$ fr., or $\dfrac{258}{5}d. = \dfrac{542}{100}$ fr.;

therefore, $1d. = \dfrac{542 \times 5}{258 \times 100}$ fr.;

therefore, $£1 = \dfrac{542 \times 5 \times 240}{258 \times 100}$ fr. $= \dfrac{1084}{43}$ fr. $= 25\frac{9}{43}$ fr.

Also, when unit of money is $\dfrac{6}{25}d.$,

$$\text{a dollar} = \frac{258}{5} \div \frac{6}{25} = \frac{258 \times 25}{5 \times 6} = 215 \text{ units},$$

$$\text{a franc} = \left(\frac{258}{5} \div \frac{542}{100}\right) \div \frac{6}{25} = \frac{258 \times 100 \times 25}{5 \times 542 \times 6}$$

$$= \frac{215 \times 100}{542} = \frac{10750}{271} = 39\tfrac{181}{271} \text{ units}.$$

(8) *A* and *B* do $\frac{1}{6}$ daily, *B* and *C* do $\frac{1}{7}$ daily;

therefore, taking these successively from the work done by *A*, *B*, and *C* daily, we have

A's work daily $= \frac{1}{4} - \frac{1}{7}$, *C*'s work daily $= \frac{1}{4} - \frac{1}{6}$;

therefore, *A* and *C* do daily $\frac{1}{4} - \frac{1}{7} + \frac{1}{4} - \frac{1}{6}$, or $\frac{4}{21}$ of the work;

therefore, *A* and *C* do it in $\frac{21}{4}$ days, or $5\frac{1}{4}$ days.

(9) Area of sheet $= (66 \times 30)$ sq. inches;

therefore, each sheet will give a strip (66×30) linear inches in length and 1 linear inch broad;

therefore, number required $= \dfrac{25000 \times 1760 \times 3 \times 12}{66 \times 30}$

$= 25000 \times 16 \times 2 = 800000$ sheets.

(10) $(20 \times 12)d. \times$ number of sovereigns = value of the sovereigns in pence,

$(12 \times 3)d. \times$ number of sovereigns = value of the shillings in pence,

$4d. \times$ number of sovereigns = value of the pence;

$\therefore$ $(240+36+4)d. \times$ number of sovereigns = value of coins in pence;

therefore, $280d. \times$ number of sovereigns $= (280 \times 20 \times 12)d.$;

therefore, number of sovereigns $= \frac{280 \times 20 \times 12}{280} = 240$,

number of shillings $= 240 \times 3 = 720$,

number of pence $= 240 \times 4 = 960$.

RULE OF THREE.

Ex. LVI. (p. 206.)

1. 4 yds. : 96 yds. :: 12*s.* : required cost;

therefore, required cost $= \frac{96 \times 12}{4} s. = £14\ 8s.$

2. £5 12*s.* : £44 16*s.* :: 9 yds. : required number of yds.;

therefore, number of yards required $= \frac{896 \times 9}{112} = 72$.

3. 7 bus. : 3 bus. :: £1 16*s.* 9*d.* : required cost;

therefore, required cost $= \frac{(£1\ 16s.\ 9d.) \times 3}{7} = 15s.\ 9d.$

4. £63 : £273 :: 42 ac. : number of acres required;

therefore, number of acres $= \frac{42 \times 273}{63} = 182$.

5. 72 tons : 54 tons :: £55 16*s.* : required cost;

therefore, required cost $= \frac{54 \times 1116}{72} s. = £41\ 17s.$

6. 6 : 13 :: £3 16*s.* 6*d.* : value required;

therefore, value required $= \frac{13 \times 918}{6} d. = £8\ 5s.\ 9d.$

7. 1*s.* 6*d.* : £3 :: 1 week : number of weeks required;

therefore, number of weeks $= \frac{720}{18} = 40$.

8. 15 : 20 :: 9 : number required;

therefore, number required = $\frac{20\times 9}{15}$ = 12.

9. £6 14*s*. 2*d*. : £29 15*s*. :: 2 cwt. 3 qrs. 14 lbs. : quantity of sugar required;

therefore, required quantity = $\frac{7140\times 322}{1610}$ lbs. = 12 cwt. 3 qrs.

10. 3 cwt. 3 qrs. : 2 cwt. 2 qrs. :: £6 16*s*. : price required;

therefore, price required = $\frac{10\times 136}{15}$ *s*. = £4 10*s*. 8*d*.

11. 4 yds. 31 in. : 23 yds. 1 ft. :: £3 15*s*. : price required;

therefore, price required = $\frac{840\times 75}{175}$ *s*. = £18.

12. £1 : £257 10*s*. :: 7*d*. : required tax;

therefore, required tax = $\frac{5150\times 7}{20}$ *d*. = £7 10*s*. 2½*d*.

13. £185 10*s*. : £1050 :: £5 8*s*. 2½*d*. : required tax;

therefore, required tax = $\frac{21000\times 5194}{3710}$ *q*. = £30 12*s*. 6*d*.

14. £429 8*s*. 3*d*. : £302 3*s*. 7*d*. :: 13*s*. 6*d*. : required tax;

therefore, required tax = $\frac{72523\times 162}{103059}$ *d*. = 9*s*. 6*d*.

15. 5*s*. 10*d*. : £27 5*s*. 5*d*. :: 1 bus. : number of bus. required;

therefore, number of bus. = $\frac{6545}{70}$ = 11 qrs. 5 bus. 2 pks.

16. 1 qr. : 2 tons 3 cwt. 14 lbs. :: 8*s*. 9½*d*. : price required;

therefore, price required = $\frac{4830\times 422}{28}$ *q*. = £75 16*s*. 6¾*d*.

17. 7*d*. : £10 1*s*. 3*d*. :: £1 : half year's income;

therefore, half year's income = £ $\frac{2415}{7}$ = £345;

therefore, year's income = £690.

18. 1 day : 215 days :: 2*s*. 4*d*. : wages required;

therefore, wages required = $\frac{215\times 28}{1}$ *d*. = £25 1*s*. 8*d*.

19. £204 16*s*. : £179 4*s*. :: £1 : sum paid in the £;

therefore, sum paid in the £ = $\frac{3584\times 20}{4096}$ *s*. = 17*s*. 6*d*.

20. 1 ton 8 cwt. 4 lbs. : 14 lbs. :: £98 1 fl. 2 c. 5 m. : price required;

therefore, price required $= \frac{14 \times 98125}{3140}$ m. $= 437\frac{1}{2}$m. $=$ 4 fl. 3 c. $7\frac{1}{2}$ m.

21. 12*s*. 8*d*. : £950 :: £1 : amount of debts;

therefore, amount required $=$ £ $\frac{228000}{152} =$ £1500.

22. $3\frac{1}{2}$ stone : 1 ton 4 cwt. 8 lbs. :: 6 fl. $1\frac{1}{4}$ c. : value required :

therefore, value required $= \frac{2696 \times 245}{49 \times 4}$ c. $=$ 3370 c. $=$ £33 7 fl.

23. 26 yds. : 1 ft. :: 52*s*. : price per foot;

therefore, price required $= \frac{52}{26 \times 3}$ *s*. $= 8$*d*.

24. 400 ac. 2 ro. 20 po. : 1 ac. :: £841 3 f. 1 c. $2\frac{1}{2}$ m. : rent per acre;

therefore, rent per acre $= \frac{160 \times 1682625}{64100 \times 2}$ m. $=$ 2100 m. $=$ £2 1 fl.

25. 3 : 3·75 :: 40 : number required;

therefore, number required $= \frac{3{\cdot}75 \times 40}{3} = \frac{150}{3} = 50$.

26. 15 men : 10 men :: 12 days : days required;

therefore, days required $= \frac{10 \times 12}{15} = 8$.

27. 62 miles : 80 miles :: 3 days : days required;

therefore, days required $= \frac{80 \times 3}{62} = 3{\cdot}8709\ldots.$

28. 3*s*. $7\frac{1}{2}$*d*. : 18*s*. $1\frac{1}{2}$*d*. :: $935\frac{1}{2}$ yds. : yards required;

therefore, number of yards required $= \frac{870 \times 1871}{174 \times 2} = 4677\frac{1}{2}$.

29. Loss on £1 debt $=$ 4 fl. 2 c. 5 m.;

therefore, £1 : £11793 5 fl. :: 425 m. : loss required;

therefore, loss $= \frac{117935 \times 425}{10}$ m. $=$ £5012 2 fl. 3 c. $7\frac{1}{2}$ m.

30. $2\frac{1}{2}$ lbs. : 2 tons 16 cwt. 17 lbs. :: 10*d*. price required;

therefore, price required $= \frac{6289 \times 10 \times 2}{5}$ *d*. $=$ £104 16*s*. 4*d*.

31. 16 hrs. : 12 hrs. :: 24 days : days required;

therefore, days required $= \frac{24 \times 12}{16} = 18$.

32. $3\frac{5}{9}$ oz. : $(30\frac{3}{7} \times 16)$ oz. :: 7*s.* : value required;

therefore, value required $= \dfrac{9 \times 3408 \times 7}{32 \times 7}$ *s.* = £47 18*s.* 6*d.*

33. 15 days : 24 days :: 5 men : number of men required;

therefore, number of men $= \dfrac{24 \times 5}{15} = 8$.

34. 356 ac. 3 ro. $39\frac{1}{2}$ po. : 2 ac. :: £951 19*s.* 10*d.* : rent required;

therefore, rent required $= \dfrac{2 \times 320 \times 228478}{114239}$ *d.* = 1280*d.* = £5 6*s.* 8*d.*

35. £2514 7*s.* 6*d.* : £1 :: £83 16*s.* 3*d.* : rate required;

therefore, rate $= \dfrac{8 \times 20115}{20115}$ *d.* = 8*d.*

and £1 : £115 12*s.* 6*d.* :: 8*d.* : rate required;

therefore, rate $= \dfrac{925 \times 8}{8}$ *d.* = £3 17*s.* 1*d.*

36. 27 bus. 2 pks. : $16\frac{1}{2}$ bus. :: £10 7*s.* $2\frac{1}{4}$*d.* : price required;

therefore, price required $= \dfrac{2 \times 33 \times 9945}{55 \times 2}$ *q.* = £6 4*s.* $3\frac{3}{4}$*d.*

37. 5 qrs. : 3 qrs. :: 40 yds. : number of yards required;

therefore, yards required $= \dfrac{3 \times 40}{5} = 24$.

38. £910 : £420 :: $6\frac{1}{2}$ mo. : number of months required;

therefore, number of months $= \dfrac{420 \times 13}{910 \times 2} = 3$.

39. Area of field = (121 × 86) sq. yds.;

therefore, 4840 yds. : (121 × 86) yds. :: £80 : price required;

therefore, price required = £ $\dfrac{121 \times 86 \times 80}{4840}$ = £172.

40. 1 lb. : ·75 cwt. :: ·5625 fl. : price required,

and ·75 cwt. = $\frac{3}{4}$ of 1 cwt. = 84 lbs.;

therefore, price = (84 × ·5625) fl. = £4 7 fl. 2 c. 5 m.

41. $3\frac{1}{2} : 28\frac{3}{4}$ :: £11 5*s.* : price required;

therefore, price required $= \dfrac{2 \times 115 \times 225}{7 \times 4}$ *s.* = £92 8*s.* $2\frac{4}{7}$*d.*

42. £12 7*s.* $11\frac{5}{8}$*d.* : £3 19*s.* $0\frac{3}{4}$*d.* :: $34\frac{1}{2}$ yds. : number of yards required;

therefore, number of yards required $= \dfrac{3795 \times 69}{23805 \times 4 \times 2} = 11$.

43. Area of field $= (50{\cdot}4 \times 56{\cdot}25)$ sq. chains $= 2835$ sq. chains $= 283{\cdot}5$ ac.;

therefore, 1 ac. : 283·5 ac. :: 30*s.* : rent required,

rent required $= (283{\cdot}5 \times 30)s. = £425\ 5s.$

44. 25 men : 12 men :: 3 days : days required;

$$\text{therefore, days required} = \frac{12 \times 3}{25} = 1\tfrac{11}{25}.$$

45. $\cdot\dot{3}$ of 4·5 cwt. $= \frac{1}{3}$ of 4·5 cwt. $= 1{\cdot}5$ cwt. $= 168$ lbs.;

therefore, 168 lbs. : 1 lb. :: 1155 c. : price required;

$$\text{therefore, price required} = \frac{1155}{168}\text{ c.} = 6\tfrac{7}{8}\text{ c.} = 6\text{ c. } 8\tfrac{3}{4}\text{ m.}$$

46. £3 17*s.* $10\frac{1}{2}d.$: £150 :: 1 oz. : number of oz. in the piece of gold;

$$\text{therefore, weight of the piece of gold} = \frac{36000}{934\frac{1}{2}}\text{ oz.}$$

$$\text{Again, 12 oz.} : \frac{36000}{934\frac{1}{2}}\text{ oz.} :: 54s.\ 6d. : \text{value of silver};$$

$$\text{therefore, value required} = \frac{36000 \times 654 \times 2}{12 \times 1869}\,d. = £8\ 14s.\ 11\tfrac{1}{2}d.\ \tfrac{46}{623}q.$$

47. $375\frac{1}{2} \times 75\frac{1}{2} : 278\frac{3}{4} \times 151 ::$ £118 2*s.* $6\frac{1}{4}d.$: value required;

therefore, price required

$$= \frac{278\frac{3}{4} \times 151 \times 113401}{375\frac{1}{2} \times 75\frac{1}{2}}\,q. = \frac{1115 \times 151 \times 113401}{751 \times 151}\,q. = £175\ 7s.\ 7\tfrac{1}{4}d.$$

48. Number of days from Jan. 1 to May 27 = 146;

therefore, 365 : 146 :: 35 guineas : wages required;

$$\text{therefore, wages required} = \frac{146 \times 35}{365}\text{ guineas} = £14\ 14s.$$

49. $$\tfrac{3}{11}\text{ of }\tfrac{2}{9}\text{ of }\tfrac{4}{17} : \frac{1\frac{2}{8}}{4\frac{1}{4}}\text{ of }\tfrac{2}{5} :: £\,\frac{400}{33} : \text{value required};$$

$$\text{therefore, value required} = £\,\frac{11 \times 9 \times 17 \times 5 \times 4 \times 2 \times 400}{3 \times 2 \times 4 \times 4 \times 17 \times 5 \times 33} = £100.$$

50. 48 yds. : 60 yds. :: 7*s.* 3*d.* : price required;

$$\text{therefore, price required} = \frac{60 \times 87}{48}\,d. = 9s.\ 0\tfrac{3}{4}d.$$

51. 19*s.* 5*d.* : £1 :: £1632 18*s.* 10*d.* : income required;

$$\text{therefore, income} = £\,\frac{391906}{233} = £1682.$$

52. £1 : £3150 :: 17*s.* $2\frac{1}{4}d.$: income required;

therefore, income $= (3150 \times 826)\,q. = £2710\ 6s.\ 3d.$

53. From noon on Monday to 10 hrs. 15 min. A.M. on Saturday there are $118\frac{1}{4}$ hrs.; therefore, $24 : 118\frac{1}{4} :: 3'\ 10''$: gain required;

$$\text{therefore, gain} = \frac{473 \times 190}{24 \times 4}\text{ sec.} = 15'\ 36\tfrac{7}{48}'';$$

therefore, time indicated by the watch will be

$$10\text{ hrs. } 15' + 15'\ 36\tfrac{7}{48}'' + 10', \text{ or } 10\text{ hrs. } 40'\ 36\tfrac{7}{48}''.$$

54. $1 : 3{\cdot}1416 :: 22\frac{1}{2}$ ft. : circumference required;

$$\text{therefore, circumference required} = \left(3{\cdot}1416 \times \frac{45}{2}\right)\text{ft.} = 70\text{ ft. } 8{\cdot}232\text{ in.}$$

55. £937 10*s.* : £1 :: £455 1*s.* $6\frac{3}{4}$*d.* : amount required;

$$\text{therefore, amount} = \frac{20 \times 436875}{18750}\,s. = 9s.\ 8\tfrac{1}{2}d.,$$

and £1 : £114 :: 10*s.* $3\frac{1}{2}$*d.* : loss on £114;

$$\text{therefore, loss} = (114 \times 494)\,q. = £58\ 13s.\ 3d.$$

56. $25\frac{3}{4} : 40 :: 3$ cwt. : weight required;

$$\text{therefore, weight required} = \frac{4 \times 40 \times 3}{103}\text{ cwt.} = 4\tfrac{68}{103}\text{ cwt.}$$

57. 14 : 365 :: £21 : annual expenditure;

$$\text{therefore, annual expenditure} = £\,\frac{365 \times 21}{14} = £547\ 10s.;$$

therefore, income must be £747 10*s.*

58. 175 guineas : £120 :: £6 17*s.* $9\frac{3}{4}$*d.* : tax required;

$$\text{therefore, tax} = \frac{2400 \times 6615}{3675}\,q. = £4\ 10s.$$

59. 1 lb. 10 oz. 10 dwts. : 1 oz. :: £6 3*s.* 9*d.* : price required;

$$\text{price per oz.} = \frac{20 \times 1485}{450}\,d. = 5s.\ 6d.$$

60. $4\frac{1}{2}$ days : 9 days :: $7\frac{1}{2}$ hrs. : number of hours required;

$$\text{therefore, number of hours} = \frac{9 \times 15 \times 2}{9 \times 2} = 15.$$

61. Cost of silver when manufactured will be

(£3 6*s.* + 18*s.* + £1 2*s.*), or £5 6*s.* per lb.;

therefore, 1 lb. : 7 lbs. 7 oz. 10 dwts. :: £5 6*s.* : price required;

$$\text{therefore, price required} = \frac{1830 \times 106}{240}\,s. = £40\ 8s.\ 3d.$$

62. 365 : 63 :: £818 + £94 10*s.* : sum required;

$$\text{therefore, sum required} = \frac{63 \times 18250}{365}\,s. = £157\ 10s.$$

63. Since 1 man = 3 boys and 1 woman = 2 boys, the question is the same as the following: if (45 + 24 + 9) boys do the work in 50 days, in what time will (27 + 30 + 18) boys do 4 times as much;

therefore, 75 : 78 :: 50 days : days required for same work;

$$\text{therefore, days required for same work} = \frac{78 \times 50}{75} = 52;$$

therefore, days required to do 4 times as much = 208.

64. Tax = £40; therefore, he has £721 7 f. 5 c. to spend annually;

therefore, 365 : 1 :: £721 7 f. 5 c. : daily expenditure;

$$\text{therefore, sum required} = \frac{72175}{365}\,\text{m.} = £1\ 9\ \text{f.}\ 5\ \text{c.}$$

65. Since 3 cows eat as much as 7 horses,

$$7 \text{ cows eat as much as } \frac{49}{3} \text{ horses};$$

$$\text{therefore, } 3 + \frac{49}{3} : 7 :: 29 : \text{days required};$$

$$\text{therefore, days} = \frac{3 \times 7 \times 29}{58} = 10\tfrac{1}{2}.$$

66. Area of room $= \frac{440}{9}$ sq. yds.;

therefore, $\frac{3}{4}$ sq. yd. : $\frac{440}{9}$ sq. yds. :: 1 yd. : number of yards required;

$$\text{therefore, number of yards required} = \frac{4 \times 440}{3 \times 9} = 65\tfrac{5}{27}.$$

67. Cost of eggs = $(50 + 33\frac{1}{3})d. = 83\frac{1}{3}d.$,

also 5 : 200 :: 2*d.* : selling price;

therefore, eggs are sold for $\frac{200 \times 2}{5}\,d. = 80d.$; therefore, loss is $3\frac{1}{3}d.$

68. From 12 P.M. on Saturday till 12 A.M. on Tuesday are 60 hours, and till 4 P.M. Thursday the clock will indicate 112 hours;

therefore, 60 hrs. 3 min. : 112 hrs. :: 3 min. : gain on true time;

$$\text{therefore, gain on true time} = \frac{60 \times 112 \times 3}{3603}\,\text{min.} = 5\tfrac{715}{1201}\,\text{min.}$$

therefore, true time will be $5\frac{715}{1201}$ min. before 4.

69. 19*s*. 2*d*. : £1 :: £728 6*s*. 8*d*. : sum required;

$$\text{therefore, sum required} = £\,\frac{240 \times 2185}{230 \times 3} = £760.$$

70. In 12 days $\frac{12}{50}$ of the work is done, and the remaining 19 men have $\frac{38}{50}$ of the work to finish. Also 19 men do $\frac{19}{50 \times 35}$ of the work daily;

$$\text{therefore, } \frac{19}{50 \times 35} : \frac{38}{50} :: 1 \text{ day} : \text{days required};$$

$$\text{therefore, days required} = \frac{50 \times 35 \times 38}{19 \times 50} = 70.$$

71. Number of square yards in 1000 coats $= 1000 \times 2\frac{1}{2} \times 1\frac{1}{4}$;

$$\therefore \frac{3}{4} \text{ sq. yd.} : \left(1000 \times \frac{5}{2} \times \frac{5}{4}\right) \text{sq.yds.} :: 1 \text{ yd.} : \text{number of yds. required};$$

$$\text{therefore, number of yards required} = \frac{4 \times 1000 \times 5 \times 5}{3 \times 2 \times 4} = 4166\tfrac{2}{3}.$$

72. $2\frac{1}{2}$ fur. : 240000 miles :: 5 oz. : weight required;

$$\text{therefore, weight required} = \frac{240000 \times 5 \times 2 \times 8}{5} \text{ oz.}$$

$$= (240000 \times 16) \text{ oz.} = 240000 \text{ lbs.}$$

73. $(3 \times 3\cdot1416)$ ft. : 4 miles :: 1 : number of revolutions;

$$\text{therefore, number of revolutions} = \frac{4 \times 1760 \times 3}{3 \times 3\cdot1416} = 2240\tfrac{3520}{3927}.$$

74. 8 oz. : ·75 ton :: ·5625*s*. : price required;

$$\text{therefore, price required} = \frac{15 \times 112 \times 16 \times \cdot5625}{8} s.$$

$$= (3360 \times \cdot5625)s. = £94\ 10s.$$

75. $\cdot458\dot{3}s.$: £61 12*s*. :: ·0625 lbs. : weight required;

$$\text{therefore, weight required} = \frac{9000 \times 1232 \times \cdot0625}{4125} \text{ lbs.} = 168 \text{ lbs.}$$

76. 4′ 10″ : 60′ :: 1 day : number of days required;

$$\text{therefore, number of days} = \frac{3600}{250} = 14 \text{ days } 9 \text{ hrs. } 36 \text{ min.};$$

therefore, the time will be on Monday fortnight at 6hrs. 36min. P.M.

77. $(2\cdot5 \times 3)$ sq. ft. : (20×27) sq. ft. :: 1 yd. : number of yards required;

$$\text{therefore, number of yards} = \frac{20 \times 27}{7\cdot5} = 72.$$

78. 960 galls. : 1 gall. :: £640 : price required;

$$\text{therefore, price required} = £\,\frac{640}{960} = 13s.\ 4d.$$

79. A soldier's daily allowance $= \frac{12}{8}$ lbs. $= 1\frac{1}{2}$ lbs.;

therefore, 1 : 366 :: $\left(850 \times \frac{3}{2}\right)$lbs. : weight required;

$$\text{therefore, weight required} = \frac{366 \times 2550}{2}\ \text{lbs.} = 466650\ \text{lbs.}$$

80. 1600 men will have provision enough for 2000 men for 80 days;

therefore, 1600 : 2000 :: 80 days : number of days required;

$$\text{therefore, number of days} = \frac{2000 \times 80}{1600} = 100.$$

81. 20 sq. poles : (10000 × 160) sq. poles :: $(1\frac{1}{2} \times 52)d.$: yearly income;

$$\text{therefore, yearly income} = \frac{10000 \times 160 \times 3 \times 52}{20 \times 2}\,d. = £26000.$$

82. 1 oz. : $\cdot 3682291\dot{6}$ lbs. :: $£4\cdot 18958\dot{3}$: value required;

therefore, value required

$$= £\,\frac{12 \times 33140625 \times 3770625}{90000000 \times 900000} = £\,\frac{2011 \times 707}{40 \times 1920} = £18\ 10s.\ 3\tfrac{17}{320}d.$$

83. 850 men will have enough provisions to last 1000 men for 68 days;

therefore, 850 : 1000 :: 68 days : time required;

$$\text{therefore, time required} = \frac{1000 \times 68}{850}\ \text{days} = 80\ \text{days}.$$

84. 1 ac. : $182\cdot\dot{3}$ ac. :: $£\,\frac{4\cdot 65}{4}$: rent required;

$$\text{therefore, rent required} = £\,\frac{547 \times 4\cdot 65}{3 \times 4} = £211\ 19s.\ 3d.$$

85. £120 + £2 10*s.* + £61 5*s.* = £183 15*s.*;

therefore, 2 tons 3 cwt. 3 qrs. : 1 cwt. :: £183 15*s.* : price required;

$$\text{therefore, price per cwt.} = \frac{4 \times 3675}{175}\,s. = £4\ 4s.$$

86. Area of piece $= (2 \times 14\frac{5}{8} \times 13\frac{2}{13})$ sq. yds.;

therefore,

$40\frac{1}{2}$sq.yds. : $\left(2 \times \frac{117}{8} \times \frac{171}{13}\right)$sq.yds. :: 1yd. : number of yards required;

$$\text{therefore, number of yards} = \frac{2 \times 117 \times 171 \times 2}{81 \times 8 \times 13} = 9\tfrac{1}{2}.$$

87. 3·75 yds. = 60 nails, and 38 yds. 2 qrs. 3 nails = 619 nails;

therefore, 60 : 619 :: £3·825 : price required;

$$\text{therefore, price} = £\,\frac{619 \times 3{\cdot}825}{60} = £39\ 9s.\ 2\tfrac{1}{2}d.\ \tfrac{4}{5}q.$$

88. 1 cow eats as much as $\frac{9}{7}$ horses, 9 cows eat as much as $\frac{81}{7}$ horses;

therefore, $4 + \frac{54}{7} : 18 + \frac{81}{7} :: 1$: relative size of second field;

therefore, size of second field $= \frac{7 \times 207}{82 \times 7} = \frac{207}{82}$ size of first field.

89. *A* reaps $\frac{1}{55}$, and *B* $\frac{1}{66}$ in one hour;

therefore, together they reap $\frac{1}{55} + \frac{1}{66}$, or $\frac{1}{30}$ in 1 hour;

therefore, $\frac{10}{30} : 1 :: 1$ day : days required; ∴ days required $= \frac{30}{10} = 3$.

DOUBLE RULE OF THREE.

Ex. LVII. (p. 222.)

1. $\left.\begin{array}{r} \text{6 ac. : 15 ac.} \\ \text{14 hrs. : 12 hrs.} \end{array}\right\}$ :: 7 men : number of men required;

$$\text{therefore, number of men} = \frac{7 \times 15 \times 12}{6 \times 14} = 15.$$

2. $\left.\begin{array}{r} \text{£15 : 15 gui.} \\ \text{9 days : 20 days} \end{array}\right\}$ :: 3 men : number of men required;

$$\text{therefore, number of men} = \frac{20 \times 315 \times 3}{9 \times 300} = 7.$$

3. $\left.\begin{array}{l} \text{7 horses : 16 horses} \\ \text{96 bus. : 66 bus.} \end{array}\right\}$ :: 42 days : number of days required;

$$\text{therefore, number of days} = \frac{66 \times 16 \times 42}{7 \times 96} = 66.$$

4. $\left.\begin{array}{l} \text{5 sacks : 15 sacks} \\ \text{2 days : 6 days} \end{array}\right\}$ :: 800 soldiers : number of soldiers required;

$$\text{therefore, number required} = \frac{15 \times 6 \times 800}{2 \times 5} = 7200.$$

5. $$\left.\begin{array}{r}\text{6 horses : 8 horses}\\ \text{13 days : 11 days}\end{array}\right\} :: \text{17 bus. : number of bushels required;}$$

$$\text{therefore, number of bushels} = \frac{11\times 8\times 17}{6\times 13} = 19\tfrac{7}{39}.$$

6. $$\left.\begin{array}{r}\text{16 horses : 12 horses}\\ \text{8 days : 5 days}\end{array}\right\} :: \text{1280 ac. : number of acres required;}$$

$$\text{therefore, number of acres} = \frac{5\times 12\times 1280}{16\times 8} = 600.$$

7. $$\left.\begin{array}{r}\text{36 cwt. 23 lbs. : 11 cwt.}\\ \text{£1 5 c. : £5 2 f. 5 c.}\end{array}\right\} :: \text{12 miles : miles required;}$$

$$\text{therefore, number of miles} = \frac{11\times 112\times 525\times 12}{105\times 4055} = 18\tfrac{186}{811}.$$

8. $$\left.\begin{array}{r}\text{53 miles : 124 miles}\\ \text{6 gui. : 3 gui.}\end{array}\right\} :: \text{8 cwt. : number of cwt. required;}$$

$$\text{therefore, number of cwt.} = \frac{3\times 124\times 8}{53\times 6} = 9\tfrac{19}{53}.$$

9. $$\left.\begin{array}{r}\text{5 men : 7 men}\\ \text{11 mo. : 4 mo.}\end{array}\right\} :: \text{£}641\tfrac{2}{3}\text{ : sum required;}$$

$$\text{therefore, sum required} = \text{£}\,\frac{7\times 4\times 1925}{5\times 11\times 3} = \text{£326 13}s.\ 4d.$$

10. $$\left.\begin{array}{r}\text{£225 : £1000}\\ \text{£100 : £}49\tfrac{1}{2}\end{array}\right\} :: \text{5 mo. : number of months required;}$$

$$\text{therefore, months required} = \frac{1000\times 495\times 5}{225\times 1000} = 11.$$

11. $$\left.\begin{array}{r}\text{3 horses : 2 horses}\\ \text{7 mo. : 11 mo.}\end{array}\right\} :: \text{£59 2}s.\ 1\tfrac{1}{2}d.\text{ : sum required;}$$

$$\text{therefore, sum required} = \frac{2\times 11\times 56742}{3\times 7}q. = \text{£61 18}s.\ 5d.$$

12. $$\left.\begin{array}{r}\text{100 miles : 160 miles}\\ \text{£3 8 f. 5 c. : £6 0}s.\ 3\tfrac{3}{4}d.\end{array}\right\} :: 4\tfrac{3}{4}\text{ cwt. : weight required;}$$

$$\therefore \text{ weight required} = \frac{160\times 6015{\cdot}625\times 19}{100\times 3850}\text{ qrs.} = \text{11 cwt. 3 qrs. 14 lbs.}$$

13. $$\left.\begin{array}{r}\text{7 men : 1 man}\\ 345\tfrac{5}{7}\text{ sq. yds. : 6 ac.}\end{array}\right\} :: \text{1 hr. : hours required;}$$

$$\text{therefore, number of hours required} = \cfrac{6\times 4840}{7\times\cfrac{2420}{7}} = 12.$$

14. $$\left.\begin{array}{r}\text{12 men : 20 men}\\ \text{£90 : £150}\end{array}\right\} :: \text{3 wks. : number of weeks required;}$$

$$\text{therefore, number of weeks} = \frac{20\times 150\times 3}{12\times 90} = 8\tfrac{1}{3}.$$

15.
$$\left.\begin{array}{r}1\text{ cwt. }3\text{ qrs. }21\text{ lbs.} : 2\tfrac{1}{2}\text{ tons}\\ 52\tfrac{1}{4}\text{ miles} : 46\tfrac{1}{2}\text{ miles}\end{array}\right\} :: 17s.\ 5d. : \text{cost required};$$

therefore, cost required $= \dfrac{5\times 2240\times 93\times 209\times 4}{2\times 2\times 217\times 209}\,d. = £20.$

16.
$$\left.\begin{array}{l}8\text{ men} : 10\text{ men}\\ 7\tfrac{1}{2}\text{ ac.} : 9\text{ ac.}\end{array}\right\} :: 36\text{ hrs.} : \text{number of hours required};$$

therefore, number of hours $= \dfrac{10\times 9\times 36\times 2}{8\times 15} = 54.$

therefore, number of days $= \dfrac{54}{16} = 3$ days 6 hrs.

17.
$$\left.\begin{array}{l}30\text{ men} : 25\text{ men}\\ 16\text{ days} : 24\text{ days}\end{array}\right\} :: 8\text{ hrs.} : \text{number of hours required};$$

therefore, number of hours $= \dfrac{8\times 25\times 24}{30\times 16} = 10.$

18.
$$\left.\begin{array}{c}17\text{ ac. }3\text{ ro. }2\text{ po.} : 26\text{ ac. }2\text{ ro. }23\text{ po.}\\ 7\text{ ac.} : 6\text{ ac.}\end{array}\right\} :: £39\ 4s.\ 7d. : \text{rent required};$$

therefore, rent required $= \dfrac{4263\times 6\times 9415}{7\times 2842}\,d. = £50\ 8s.\ 9d.$

19.
$$\left.\begin{array}{c}1500\text{ copies} : 5000\text{ copies}\\ 11\text{ sheets} : 25\text{ sheets}\end{array}\right\} :: 66\text{ reams} : \text{number of reams required};$$

therefore, number of reams $= \dfrac{5000\times 25\times 66}{11\times 1500} = 500.$

20.
$$\left.\begin{array}{c}7\text{ men} : 5\text{ men}\\ 12\text{ hrs.} : 14\text{ hrs.}\\ 800\text{ ft.} : 1800\text{ ft.}\\ 700\text{ ft.} : 960\text{ ft.}\end{array}\right\} :: 3\tfrac{1}{2}\text{ days} : \text{number of days required};$$

therefore, number of days $= \dfrac{5\times 14\times 1800\times 960\times 7}{7\times 12\times 800\times 700\times 2} = 9.$

21.
$$\left.\begin{array}{c}1500\text{ men} : 1000\text{ men}\\ 6\tfrac{2}{3}\text{ oz.} : 16\text{ oz.}\end{array}\right\} :: 5\text{ wks.} : \text{number of weeks required};$$

therefore, number of weeks $= \dfrac{1000\times 16\times 5\times 3}{1500\times 20} = 8.$

22.
$$\left.\begin{array}{r}60\text{ masons} : 20\text{ masons}\\ 10\text{ hrs.} : 7\text{ hrs.}\\ 50\text{ ft.} : 500\text{ ft.}\\ 2\text{ ft.} : 4\text{ ft.}\\ 14\text{ ft.} : 16\text{ ft.}\end{array}\right\} :: 12\text{ days} : \text{number of days required};$$

therefore, number of days $= \dfrac{20\times 7\times 500\times 4\times 16\times 12}{60\times 10\times 50\times 2\times 14} = 64.$

23. $$\left.\begin{array}{r}\frac{24}{5}\text{ days : 24 days}\\ \text{1 day : 7 days}\end{array}\right\}\text{:: 10 men : number of men required;}$$

$$\text{therefore, number of men} = \frac{24\times7\times10\times5}{24} = 350.$$

24. $$\left.\begin{array}{r}\text{100 yds. : 1000 yds.}\\ \text{20 ft. : 16 ft.}\\ \text{4 ft. : 6 ft.}\\ \text{30 hrs. : 48 hrs.}\end{array}\right\}\text{:: 125 men : number of men required;}$$

$$\text{therefore, number of men} = \frac{1000\times16\times6\times48\times125}{100\times20\times4\times30} = 2400.$$

25. $$\left.\begin{array}{r}5\text{ ft. : }12\tfrac{1}{2}\text{ ft.}\\ 3\tfrac{3}{4}\text{ ft. : }6\tfrac{1}{2}\text{ ft.}\\ 2\tfrac{1}{2}\text{ ft. : }8\tfrac{1}{4}\text{ ft.}\end{array}\right\}\text{:: 7500 lbs. : weight required;}$$

$$\text{therefore, weight required} = \frac{25\times13\times33\times2\times4\times7500}{2\times2\times4\times5\times15\times5}\text{ lbs.}$$

$$= \text{47 tons. 17 cwt. 66 lbs.}$$

26. $$\left.\begin{array}{r}\pounds20 : \pounds72\\ 5s. : 4\tfrac{1}{2}s.\end{array}\right\}\text{:: 100 men : men required;}$$

$$\text{therefore, number of men} = \frac{72\times9\times100}{2\times5\times20} = 324.$$

27. Here 25 horses eat as much as 40 ponies. Also for £41 5*s.* we can buy at 22*s.* a quarter, $\frac{825}{22}$ qrs., or $\frac{75}{2}$ qrs.;

$$\text{therefore, }\left.\begin{array}{r}\text{40 ponies : 12 ponies}\\ \text{15 qrs. : }\frac{75}{2}\text{ qrs.}\end{array}\right\}\text{:: 64 days : number of days required;}$$

$$\text{therefore, number of days} = \frac{12\times75\times64}{40\times15\times2} = 48.$$

28. $$\left.\begin{array}{r}42\tfrac{1}{2}\text{ yds. : }118\tfrac{1}{4}\text{ yds.}\\ \text{18 in. : 36 in.}\end{array}\right\}\text{:: }\pounds59\ 14s.\ 2d.\text{ : cost required;}$$

$$\text{therefore, cost} = \frac{473\times36\times2\times14330}{4\times85\times18}\,d. = \pounds332\ 5s.\ 2\tfrac{4}{17}d.$$

29. $$\left.\begin{array}{r}\text{124 men : 62 men}\\ \text{55 hrs. : 63 hrs.}\end{array}\right\}\text{:: }(110\times3\times3\times4)\text{ cub. ft. : number of cub. ft. required;}$$

$$\text{therefore, number of cub. ft.} = \frac{110\times3\times3\times4\times62\times63}{55\times124} = 2268.$$

30. $\left.\begin{array}{r}3{\cdot}35 \text{ lbs.} : 47{\cdot}5 \text{ lbs.}\\ 4{\cdot}75s. : 13{\cdot}4s.\end{array}\right\} :: 4d. : \text{price required};$

$$\text{therefore, price required} = \frac{47{\cdot}5\times13{\cdot}4\times4}{3{\cdot}35\times4{\cdot}75}\,d.$$

$$=\frac{475\times134\times4\times100}{335\times475}\,d. = 13s.\ 4d.$$

31. $\left.\begin{array}{r}63 \text{ ft.} : 14 \text{ ft.}\\ \pounds3 : \pounds4\tfrac{1}{2}\end{array}\right\} :: 24 \text{ ft.} : \text{number of feet required};$

$$\text{therefore, number of feet} = \frac{14\times9\times24}{63\times3\times2} = 8.$$

32. $\left.\begin{array}{r}24 \text{ in.} : 27 \text{ in.}\\ 4\tfrac{1}{2}d. : 4d.\end{array}\right\} :: \pounds2\ 3s.\ 1\tfrac{1}{2}d. : \text{cost required};$

$$\text{therefore, cost} = \frac{(\pounds2\ 3s.\ 1\tfrac{1}{2}d.)\times27\times4\times2}{24\times9} = \pounds2\ 3s.\ 1\tfrac{1}{2}d.$$

33. $\left.\begin{array}{r}7 \text{ men} : 4 \text{ men}\\ 16 \text{ days} : 42 \text{ days}\end{array}\right\} :: 880 \text{ yds.} : \text{number of yards required};$

$$\text{therefore, number of yards} = \frac{880\times4\times42}{7\times16} = 1320.$$

34. $\left.\begin{array}{r}3\tfrac{1}{4} \text{ ft.} : 2\tfrac{1}{4} \text{ ft.}\\ 7\tfrac{1}{2} \text{ in.} : 8 \text{ in.}\\ 1280 \text{ lbs.} : 2028 \text{ lbs.}\end{array}\right\} :: 16 \text{ ft.} : \text{number of feet required};$

$$\text{therefore, number of feet} = \frac{9\times8\times2028\times16\times2\times4}{13\times15\times1280\times4} = 18\tfrac{18}{25}.$$

35. Here 12 oxen eat as much as 28 sheep,

9 oxen .... 21 sheep;

$\therefore \left.\begin{array}{r}(28+35) \text{ sheep} : (21+12) \text{ sheep}\\ 8 \text{ days} : 28 \text{ days}\end{array}\right\} :: (12\tfrac{3}{5}\times4) \text{ gui.} : \text{cost required};$

$$\text{therefore, cost} = \frac{33\times28\times63\times4}{63\times8\times5} \text{ gui.} = \pounds97\ 0s.\ 4\tfrac{4}{5}d.$$

36. Here 1 man does $\frac{3}{2}$ of a woman's work;

$\therefore \left.\begin{array}{r}(3+1) \text{women} : (\tfrac{3}{2}+2) \text{women}\\ 1 \text{ woman} : 4 \text{ women}\end{array}\right\} :: 10 \text{ days} : \text{number of days required};$

$$\text{therefore, number of days} = \frac{7\times4\times10}{4\times2} = 35.$$

37. $\left.\begin{array}{r}142{\cdot}2 \text{ miles} : 505{\cdot}6 \text{ miles}\\ 8{\cdot}4 \text{ hrs.} : 10{\cdot}164 \text{ hrs.}\end{array}\right\} :: 4\tfrac{1}{2} \text{ days} : \text{number of days required};$

$$\text{therefore, number of days} = \frac{505{\cdot}6\times10{\cdot}164\times9}{8{\cdot}4\times142{\cdot}2} = 19{\cdot}36.$$

38.
$$\left.\begin{array}{r}\frac{1}{2}s. : 18\frac{2}{15}s.\\ 18\frac{2}{5}s. : 5\frac{3}{4}s.\end{array}\right\} :: 4\frac{7}{20}\text{ lbs. : number of lbs. required;}$$
$$\text{therefore, number of lbs.} = \frac{272\times23\times87\times5\times2}{20\times92\times15\times4} = \frac{29\times17}{10} = 49\cdot3.$$

39.
$$\left.\begin{array}{r}9\text{ people : }8\text{ people}\\ 12\text{ mo. : }7\text{ mo.}\\ 5 : 3\end{array}\right\} :: (1560\times21)s.\text{ : cost in shillings.}$$
$$\text{therefore, cost} = \frac{8\times7\times3\times1560\times21}{9\times12\times5}s. = £509\ 12s.$$

SIMPLE INTEREST.

Ex. LVIII. (p. 228.)

1. (1)
$$\begin{array}{r}£.\\ 85\\ 5\\ \hline £4\cdot25\\ 20\\ \hline 5\cdot00s.\end{array}$$

(2)
$$\begin{array}{r}£.\\ 310\\ 4\\ \hline £12\cdot40\\ 20\\ \hline 8\cdot00s.\end{array}$$

(3)
$$\begin{array}{r}£.\\ 1000\\ 4\frac{1}{2}\\ \hline 4000\\ 500\\ \hline £45\cdot00\end{array}$$

(4)
$$\begin{array}{r}£.\\ 475\\ 5\\ \hline £23\cdot75\\ 20\\ \hline 15\cdot00s.\end{array}$$

and £23 15*s.* × 3 = £71 5*s.*

(5)
$$\begin{array}{rcrcr}£. & & s. & & d.\\ 936 & . & 11 & . & 3\\ & & & & 4\\ \hline 37\cdot46 & . & 5 & . & 0\\ 20 & & & & \\ \hline 9\cdot25s. & & & & \\ 12 & & & & \\ \hline 3\cdot00d. & & & & \end{array}$$

$$\begin{array}{rcrcr}£. & & s. & & d.\\ \text{and }37 & . & 9 & . & 3\\ & & & & 2\\ \hline £74 & . & 18 & . & 6\end{array}$$

(6)
$$\begin{array}{rcrcr}£. & & s. & & d.\\ 556 & . & 13 & . & 4\\ & & & & 5\\ \hline 27\cdot83 & . & 6 & . & 8\\ 20 & & & & \\ \hline 16\cdot66s. & & & & \\ 12 & & & & \\ \hline 8\cdot00d. & & & & \end{array}$$

$$\begin{array}{rcrcr}£. & & s. & & d.\\ \text{and }27 & . & 16 & . & 8\\ & & & & 6\\ \hline £167 & . & 0 & . & 0\end{array}$$

(7)
$$\begin{array}{rcrcr}£. & & s. & & d.\\ 945 & . & 10 & . & 0\\ & & & & 4\\ \hline 37\cdot82 & . & 0 & . & 0\\ 20 & & & & \\ \hline 16\cdot40s. & & & & \\ 12 & & & & \\ \hline 4\cdot80d. & & & & \\ 4 & & & & \\ \hline 3\cdot20q. & & & & \end{array}$$

$$\begin{array}{rcrcr}£. & & s. & & d.\ \ q.\\ \text{and }37 & . & 16 & . & 4\frac{3}{4}\,\frac{1}{5}\\ & & & & 2\\ \hline \textit{Ans. }£75 & . & 12 & . & 9\frac{1}{2}\,\frac{2}{5}\end{array}$$

(8)
$$\begin{array}{rcrcr}£. & & s. & & d.\\ 198 & . & 6 & . & 8\\ & & & & 3\frac{1}{2}\\ \hline 595 & . & 0 & . & 0\\ 99 & . & 3 & . & 4\\ \hline 6\cdot94 & . & 3 & . & 4\\ 20 & & & & \\ \hline 18\cdot83s. & & & & \\ 12 & & & & \\ \hline 10\cdot00d. & & & & \end{array}$$

(9)
£. s. d.
236 . 6 . 8
3
7·09 . 0 . 0
20
1·80*s.*
12
9·60*d.*
4
2·40*q.*

£. s. d. q.
and 7 . 1 . 9½ ⅖
2½
14 . 3 . 7 ⅘
3 . 10 . 10¾ ⅕
£17 . 14 . 6

(10)
£. s. d.
98 . 15 . 10
2½
197 . 11 . 8
49 . 7 . 11
2·46 . 19 . 7
20
9·39*s.*
12
4·75*d.*
4
3·00*q.*

£. s. d. q.
and 2 . 9 . 4¾
½
£1 . 4 . 8¼ ½

2. (1)
£. s. d.
1000 . 0 . 0
4¼
4000 . 0 . 0
250 . 0 . 0
42·50 . 0 . 0
20
10·00*s.*

£. s.
42 . 10
2
85 . 0 interest.
1000 . 0 principal.
1085 . 0 amount.

(2)
£. s. d.
2833 . 6 . 8
3
£85·00 . 0 . 0

£. s. d.
85 . 0 . 0
4½
340 . 0 . 0
42 . 10 . 0
382 . 10 . 0
2833 . 6 . 8
Amount £3215 . 16 . 8

(3)
m.
1050625
4¼
4202500
262656¼
44651·56¼ interest for 1 year
6
267909·37½ interest for 6 years
1050625· principal
1318534·375 amount.

∴ *Ans.* £1318 5 f. 3 c. 4⅜ m.

(4)
£. s. d.
139 . 12 . 6
$5\frac{1}{2}$
698 . 2 . 6
69 . 16 . 3
7·67 . 18 . 9
20
13·58*s*. .
12
7·05*d.*
4
·20

£. s. d. q.
7 . 13 . 7 $\frac{1}{5}$
$3\frac{1}{2}$
23 . 0 . 9 $\frac{3}{5}$
3 . 16 . $9\frac{1}{2}$ $\frac{1}{10}$
26 . 17 . $6\frac{1}{2}$ $\frac{7}{10}$
139 . 12 . 6
£166 . 10 . $0\frac{1}{2}$ $\frac{7}{10}$

(5)
£. s. d.
1989 . 15 . 0
$2\frac{3}{4}$
3979 . 10 . 0
994 . 17 . 6
497 . 8 . 9
54·71 . 16 . 3
20
14·36*s.*
12
4·35*d.*
4
1·40*q.*

£. s. d. q.
54 . 14 . $4\frac{1}{4}$ $\frac{2}{5}$
$4\frac{3}{4}$
218 . 17 . $5\frac{1}{4}$ $\frac{3}{5}$
27 . 7 . 2 $\frac{7}{10}$
13 . 13 . 7 $\frac{7}{20}$
259 . 18 . $2\frac{1}{2}$ $\frac{13}{20}$
1989 . 15 . 0
£2249 . 13 . $2\frac{1}{2}$ $\frac{13}{20}$

(6)
£. s. d.
1534 . 6 . 3
$3\frac{1}{4}$
4602 . 18 . 9
383 . 11 . $6\frac{3}{4}$
49·86 . 10 . $3\frac{3}{4}$
20
17·30*s.*
12
3·63*d.*
4
2·55*q.*

£. s. d. q.
49 . 17 . $3\frac{1}{2}$ $\frac{11}{20}$
$1\frac{5}{8}$
49 . 17 . $3\frac{1}{2}$ $\frac{11}{20}$
24 . 18 . $7\frac{3}{4}$ $\frac{11}{40}$
6 . 4 . $7\frac{3}{4}$ $\frac{131}{160}$
81 . 0 . $7\frac{1}{4}$ $\frac{103}{160}$
1534 . 6 . 3
£1615 . 6 . $10\frac{1}{4}$ $\frac{103}{160}$

(7)
£. s. d.
411 . 10 . 0
$4\frac{7}{8}$
1646 . 0 . 0
360 . 1 . 3
20·06 . 1 . 3
20
1·21*s.*
12
2·55*d.*
4
2·20*q.*

£. s. d. q.
20 . 1 . $2\frac{1}{2}$ $\frac{1}{5}$
$\frac{1}{4}$
5 . 0 . $3\frac{1}{2}$ $\frac{11}{20}$
411 . 10 . 0
£416 . 10 . $3\frac{1}{2}$ $\frac{11}{20}$

(8)

$$\begin{array}{rl}
\text{m.} & \\
1595125 & \\
3\frac{3}{4} & \\
\hline
4785375 & \\
797562\frac{1}{2} & \\
398781\frac{1}{4} & \\
\hline
59817{\cdot}18\frac{3}{4} & \text{interest for 1 year} \\
5\frac{3}{4} & \\
\hline
29908593\frac{3}{4} & \\
2990859\frac{3}{8} & \\
1495429\frac{11}{16} & \\
\hline
343948{\cdot}82\frac{13}{16} & \text{interest for } 5\frac{3}{4} \text{ years} \\
1595125 & \\
\hline
1939073{\cdot}82\frac{13}{16} &
\end{array}$$

therefore, amount = £1939 0 f. 7 c. 3·828125 m.

3. (1)

$$\begin{array}{rcr}
\text{£.} & & s. \\
375 & . & 0 \\
 & & 3\frac{1}{2} \\
\hline
1125 & . & 0 \\
187 & . & 10 \\
\hline
13{\cdot}12 & \cdot & 10 \\
20 & & \\
\hline
2{\cdot}50s. & & \\
12 & & \\
\hline
6{\cdot}00d. & &
\end{array}
\qquad
\begin{array}{rcrcrl}
\text{£.} & & s. & & d. & \\
13 & . & 2 & . & 6 & \\
 & & & & 3\frac{2}{3} & \\
\hline
39 & . & 7 & . & 6 & \\
8 & . & 15 & . & 0 & \\
\hline
48 & . & 2 & . & 6 & \text{interest} \\
375 & . & 0 & . & 0 & \\
\hline
423 & . & 2 & . & 6 & \text{amount.}
\end{array}$$

(2)

$$\begin{array}{rcr}
\text{£.} & & s. \\
446 & . & 10 \\
 & & 5 \\
\hline
22{\cdot}32 & . & 10 \\
20 & & \\
\hline
6{\cdot}50s. & & \\
12 & & \\
\hline
6{\cdot}00d. & &
\end{array}
\qquad
\begin{array}{rcrcrl}
\text{£.} & & s. & & d. & \\
22 & . & 6 & . & 6 & \\
 & & & & 3\frac{1}{4} & \\
\hline
66 & . & 19 & . & 6 & \\
5 & . & 11 & . & 7\frac{1}{2} & \\
\hline
72 & . & 11 & . & 1\frac{1}{2} & \text{interest} \\
446 & . & 10 & . & 0 & \\
\hline
\text{£}519 & . & 1 & . & 1\frac{1}{2} & \text{amount.}
\end{array}$$

(3)

$$\begin{array}{r}
\text{£.} \\
220 \\
3\frac{3}{4} \\
\hline
660 \\
165 \\
\hline
8{\cdot}25 \\
20 \\
\hline
5{\cdot}00s.
\end{array}
\qquad
\begin{array}{r|rcrcrl}
 & \text{£.} & & s. & & d. & \\
 & 8 & . & 5 & . & 0 & \\
 & & & & & 7 & \\
\hline
12 & 57 & . & 15 & . & 0 & \\
\hline
 & 4 & . & 16 & . & 3 & \text{interest} \\
 & 220 & . & 0 & . & 0 & \\
\hline
 & \text{£}224 & . & 16 & . & 3 & \text{amount.}
\end{array}$$

(4)

$$\begin{array}{rcrcl}
\pounds. & & s. & & d. \\
243 & . & 10 & . & 0 \\
 & & & & 4\frac{3}{4} \\ \hline
974 & . & 0 & . & 0 \\
121 & . & 15 & . & 0 \\
60 & . & 17 & . & 6 \\ \hline
11{\cdot}56 & . & 12 & . & 6 \\
20 & & & & \\ \hline
11{\cdot}32s. & & & & \\
12 & & & & \\ \hline
3{\cdot}90d. & & & & \\
4 & & & & \\ \hline
3{\cdot}60q. & & & &
\end{array}$$

$$\begin{array}{rcrcllr}
\pounds. & & s. & & d. & q. & \\
11 & . & 11 & . & 3\frac{3}{4} & \frac{3}{5} & \\
 & & & & & 2 & \\ \hline
23 & . & 2 & . & 7\frac{3}{4} & \frac{3}{5} & \\
3 & . & 17 & . & 1\frac{1}{4} & \frac{1}{5} & \text{for 4 months} \\
0 & . & 19 & . & 3\frac{1}{4} & \frac{3}{10} & \text{for 1 month} \\ \hline
27 & . & 19 & . & 0\frac{1}{4} & \frac{7}{10} & \text{interest} \\
243 & . & 10 & . & 0 & & \\ \hline
\pounds271 & . & 9 & . & 0\frac{1}{4} & \frac{7}{10} & \text{amount}
\end{array}$$

(5)

$$\begin{array}{rcr}
\pounds. & & s. \\
10 & . & 10 \\
 & & 3\frac{1}{2} \\ \hline
31 & . & 10 \\
5 & . & 5 \\ \hline
{\cdot}36 & . & 15 \\
20 & & \\ \hline
7{\cdot}35s. & & \\
12 & & \\ \hline
4{\cdot}20d. & &
\end{array}$$

therefore, interest required $= \frac{117}{365}$ of 7*s*. 4$\frac{1}{5}$*d*.

$$= \frac{117 \times 441}{365 \times 5}\, d.$$

$= 2s.\ 4\frac{497}{1825}d.$,

and amount $= \pounds10\ 12s.\ 4\frac{497}{1825}d.$

(6)

$$\begin{array}{rcrcl}
\pounds. & & s. & & d. \\
684 & . & 18 & . & 8 \\
 & & & & 4\frac{1}{8} \\ \hline
2739 & . & 14 & . & 8 \\
85 & . & 12 & . & 4 \\ \hline
28{\cdot}25 & . & 7 & . & 0 \\
20 & & & & \\ \hline
5{\cdot}07s. & & & & \\
12 & & & & \\ \hline
{\cdot}84d. & & & &
\end{array}$$

$$\begin{array}{rrcrcll}
 & \pounds. & & s. & & d. & \\
 & 28 & . & 5 & . & 0\frac{21}{25} & \\
 & & & & & 11 & \\ \hline
12 \big| & 310 & . & 15 & . & 9\frac{6}{25} & \\ \hline
 & 25 & . & 17 & . & 11\frac{77}{100} & \\
 & 28 & . & 5 & . & 0\frac{21}{25} & \\ \hline
 & 54 & . & 3 & . & 0\frac{61}{100} & \text{interest} \\
 & 684 & . & 18 & . & 8 & \\ \hline
 & \pounds739 & . & 1 & . & 8\frac{61}{100} & \text{amount.}
\end{array}$$

(7)

$$\begin{array}{rcr}
\pounds. & & s. \\
42 & . & 0 \\
 & & 3\frac{1}{8} \\ \hline
126 & . & 0 \\
5 & . & 5 \\ \hline
1{\cdot}31 & . & 5 \\
20 & & \\ \hline
6{\cdot}25s. & & \\
12 & & \\ \hline
3{\cdot}00d. & &
\end{array}$$

Now, from March 16, 1850 to Jan. 23, 1851, there were 313 days;

therefore, interest required $= \frac{313}{365}$ of £1 6*s*. 3*d*.

$= \pounds1\ 2s.\ 6\frac{2}{73}d.$,

and amount $= \pounds43\ 2s.\ 6\frac{2}{73}d.$

(8)
£. s. d.
320 . 15 . 0
$4\frac{3}{4}$
1283 . 0 . 0
240 . 11 . 3
15 23 . 11 . 3
20
4·71s.
12
8·55d.
4
2·20q.

Now interest for
35 days $= \frac{35}{365}$ of £15 4s. $8\frac{1}{2}$d. $\frac{1}{5}$q.
$=$ £1 9s. $2\frac{1}{2}$d. $\frac{187}{365}$q.;

£. s. d. q.
∴ 15 . 4 . $8\frac{1}{2}$ $\frac{1}{5}$
2
30 . 9 . 5 $\frac{4}{5}$ interest for 2 years
1 . 9 . $2\frac{1}{2}$ $\frac{187}{365}$ for 35 days
31 . 18 . $7\frac{1}{2}$ $\frac{333}{365}$ interest
320 . 15 . 0
£352 . 13 . $7\frac{1}{2}$ $\frac{333}{365}$ amount.

(9)
£. s.
34 . 10
$4\frac{1}{2}$
138 . 0
17 . 5
1·55 . 5
20
11·05s.
12
·60d.
4
2·40q.

Now from Aug. 10 to Oct. 21 there are 72 days;
therefore, interest required
$= \frac{72}{365}$ of £1 11s. $0\frac{1}{2}$d. $\frac{2}{5}$q.
$=$ 6s. $1\frac{1}{4}$d. $\frac{1819}{1825}$q.;
therefore, amount $=$ £34 16s. $1\frac{1}{4}$d. $\frac{1819}{1825}$q.

4.
£. s. d.
715 . 12 . 6
$4\frac{1}{2}$
2862 . 10 . 0
357 . 16 . 3
32·20 . 6 . 3
20
4·06s.
12
0·75d.
4
3·00q.

therefore, brokerage $=$ £32 4s. $0\frac{3}{4}$d.

5.
£.
4000
$\frac{1}{2}$
£20·00

therefore, insurance $=$ £20.

6. £$95\frac{1}{2}$: £1910 :: £100 : sum required;

therefore, sum required $=$ £ $\frac{1910 \times 100 \times 2}{191} =$ £2000.

7. £$92\frac{1}{2}$: £525 :: £100 : sum required;

therefore, sum required $=$ £ $\frac{525 \times 100 \times 2}{185} =$ £567 11s. $4\frac{8}{37}$d.

Ex. LIX. (p. 230.)

1. £120 : £150 8*s*. :: £100 : sum required;

$$\text{therefore, sum required} = £\frac{752 \times 100}{5 \times 120} = £125\ 6s.\ 8d.$$

2. £540 : £100 :: ⅑ of £194 8*s*. : rate required;

$$\text{therefore, rate required} = £\frac{100 \times 972}{540 \times 9 \times 5} = £4.$$

3. Interest on £350 for 1 year = £10 5 f.;

therefore, £10 5 f. : £52 5 f. :: 1 year : time required;

$$\text{therefore, time required} = \frac{525}{105}\text{ years} = 5\text{ years}.$$

4. Interest for 1 year = ²⁄₇ of £48 9*s*. 4¼*d*. = £13 16*s*. 11½*d*.;

therefore, £325 16*s*. 8*d*. : £100 :: £13 16*s*. 11½*d*. : rate required;

$$\text{therefore, rate required} = £\frac{100 \times 13294}{78200} = £4\tfrac{1}{4}.$$

5. Interest on £142 10*s*. for 1 year = £4 19*s*. 9*d*.;

therefore, £4 19*s*. 9*d*. : £84 15*s*. 9*d*. :: 1 year : time required;

$$\text{therefore, time required} = \frac{20349}{1197}\text{ years} = 17\text{ years}.$$

6. £157 15*s*. 4*d*. : 100 :: ¹⁄₂₅ of £138 0*s*. 11*d*. : rate required;

$$\text{therefore, rate required} = £\frac{100 \times 33131}{37864 \times 25} = £3\tfrac{1}{2}.$$

7. £4½ : £25⅕ :: £100 : sum required;

$$\text{therefore, sum required} = £\frac{126 \times 100 \times 2}{5 \times 9} = £560.$$

8. £100 amounts in 3½ years to £114⅞;

therefore, £114⅞ : £105 6*s*. 0½*d*. :: £100 : sum required;

$$\text{therefore, sum required} = £\frac{101090 \times 100}{110280} = £91\ 13s.\ 4d.$$

9. £112 : £387 7*s*. $7\frac{1}{5}$*d*. :: £100 : sum required;

therefore, sum required $= £\,\dfrac{464856 \times 100}{26880 \times 5} = £345$ 17*s*. 6*d*.

10. Interest on £1275 for 1 year = £48 9*s*.;

therefore, £48 9*s*. : £274 11*s*. :: 1 year : time required;

therefore, time required $= \dfrac{5491}{969}$ years $= 5\frac{2}{3}$ years.

11. £936 13*s*. 4*d*. : £100 :: $\frac{8}{39}$ of £220 14*s*. $0\frac{1}{2}$*d*. : rate required;

therefore, rate required $= £\,\dfrac{100 \times 211874 \times 8}{224800 \times 39} = £4\frac{5}{8}$.

12. Interest on £125 for 1 year = £6 5*s*.;

therefore, £6 5*s*. : £125 :: 1 year : time required;

therefore, time required $= \dfrac{125 \times 20}{125}$ years = 20 years.

13. £100 in 10 years amounts to £135;

therefore, £135 : £100 :: £425 19*s*. $4\frac{4}{5}$*d*. : sum required;

therefore, sum required $= \dfrac{100 \times 34077\frac{3}{5}}{135}$ *q*. = £315 10*s*. 8*d*.

Again, interest on £315 10*s*. 8*d*. for 1 year, at $3\frac{1}{2}$ per cent., will be £11 0*s*. 10·48*d*.,

and £453 11*s*. 7*d*. − £425 19*s*. $4\frac{4}{5}$*d*.

= £27 12*s*. $2\frac{1}{5}$*d*. the interest to be acquired;

therefore, £11 0*s*. 10·48*d*. : £27 12*s*. 2·2*d*. :: 1 year : time required;

therefore, time required $= \dfrac{6626{\cdot}2}{2650{\cdot}48}$ years $= 2\frac{1}{2}$ years.

14. Interest on £250 for 1 year = £7 10*s*.;

therefore, interest on £250 will amount in 6 years to £45.

Again, £100 in 4 years, at 5 per cent., will acquire £20 interest;

therefore, £20 : £45 :: £100 : sum required;

therefore, sum required $= £\,\dfrac{45 \times 100}{20} = £225$.

COMPOUND INTEREST.

Ex. LX. (p. 232.)

1\.
£.
2000
4
£80·00

£.
2080
4
83·20
20
4·00*s.*

£. *s.*
80 . 0 interest for 1st year
83 . 4 interest for 2nd year
£163 . 4 interest required.

2\.
£.
800 = 1st principal
3¾
2400
600
£30·00

£. *s.*
830 . 0 = 2nd principal
3¾
2490 . 0
622 . 10
31·12 . 10
20
2·50*s.*
12
6·00*d.*

£. *s.* *d.*
830 . 0 . 0
31 . 2 . 6
861 . 2 . 6 = 3rd principal
3¾
2583 . 7 . 6
645 . 16 . 10½
32·29 . 4 . 4½
20
5·84*s.*
12
10·12*d.*
4
·50*q.*

£. *s.* *d.*
861 . 2 . 6
32 . 5 . 10⅛
£893 . 8 . 4⅛ = amount.

3\.
£.
270 = 1st principal
3
8·10
20
2·00*s.*

£. *s.*
278 . 2 = 2nd principal
3
8·34 . 6
20
6·86*s.*
12
10·32*d.*
4
1·28*q.*

£. *s.* *d.* *q.*
8 . 2 . 0
8 . 6 . 10¼ 7/25
£16 . 8 . 10¼ 7/25 = interest required.

4.

$$\begin{array}{r l}
\text{£.} & \\
690 & = \text{1st principal} \\
4\frac{1}{2} & \\ \hline
2760 & \\
345 & \\ \hline
31{\cdot}05 & \\
20 & \\ \hline
1{\cdot}00\textit{s}. &
\end{array}$$

$$\begin{array}{r c r c r l}
\text{£.} & & \textit{s}. & & \textit{d}. & \\
721 & . & 1 & . & 0 & = \text{2nd principal} \\
 & & & & 4\frac{1}{2} & \\ \hline
2884 & . & 4 & . & 0 & \\
360 & . & 10 & . & 6 & \\ \hline
32{\cdot}44 & . & 14 & . & 6 & \\
20 & & & & & \\ \hline
8{\cdot}94\textit{s}. & & & & & \\
12 & & & & & \\ \hline
11{\cdot}34\textit{d}. & & & & &
\end{array}$$

$$\begin{array}{r c r c r l}
\text{£.} & & \textit{s}. & & \textit{d}. & \\
721 & . & 1 & . & 0 & \\
32 & . & 8 & . & 11{\cdot}34 & \\ \hline
753 & . & 9 & . & 11{\cdot}34 & = \text{3rd principal} \\
 & & & & 4\frac{1}{2} & \\ \hline
3013 & . & 19 & . & 9{\cdot}36 & \\
376 & . & 14 & . & 11{\cdot}67 & \\ \hline
33{\cdot}90 & . & 14 & . & 9{\cdot}03 & \\
20 & & & & & \\ \hline
18{\cdot}14\textit{s}. & & & & & \\
12 & & & & & \\ \hline
1{\cdot}7703 & & & & &
\end{array}$$

$$\begin{array}{r c r c r l}
\text{£.} & & \textit{s}. & & \textit{d}. & \\
753 & . & 9 & . & 11.34 & \\
33 & . & 18 & . & 1{\cdot}7703 & \\ \hline
\text{£}787 & . & 8 & . & 1{\cdot}1103 & = \text{amount.}
\end{array}$$

5.

$$\begin{array}{r c r l}
\text{£.} & & \textit{s}. & \\
230 & . & 15 & = \text{1st principal} \\
 & & 5 & \\ \hline
11{\cdot}53 & . & 15 & \\
20 & & & \\ \hline
10{\cdot}75\textit{s}. & & & \\
12 & & & \\ \hline
9{\cdot}00\textit{d}. & & &
\end{array}$$

$$\begin{array}{r c r c r l}
\text{£.} & & \textit{s}. & & \textit{d}. & \\
242 & . & 5 & . & 9 & = \text{2nd principal} \\
 & & & & 5 & \\ \hline
12{\cdot}11 & . & 8 & . & 9 & \\
20 & & & & & \\ \hline
2{\cdot}28\textit{s}. & & & & & \\
12 & & & & & \\ \hline
3{\cdot}45\textit{d}. & & & & & \\
4 & & & & & \\ \hline
1{\cdot}80\textit{q}. & & & & &
\end{array}$$

$$\begin{array}{r c r c r l}
\text{£.} & & \textit{s}. & & \textit{d}.\ \textit{q}. & \\
242 & . & 5 & . & 9 & \\
12 & . & 2 & . & 3\frac{1}{4}\,\frac{4}{5} & \\ \hline
254 & . & 8 & . & 0\frac{1}{4}\,\frac{4}{5} & = \text{3rd principal} \\
 & & & & 5 & \\ \hline
12{\cdot}72 & . & 0 & . & 2\frac{1}{4} & \\
20 & & & & & \\ \hline
14{\cdot}40\textit{s}. & & & & & \\
12 & & & & & \\ \hline
4{\cdot}82\textit{d}. & & & & & \\
4 & & & & & \\ \hline
3{\cdot}29\textit{q}. & & & & &
\end{array}$$

$$\begin{array}{r c r c r l}
\text{£.} & & \textit{s}. & & \textit{d}.\ \textit{q}. & \\
254 & . & 8 & . & 0\frac{1}{4}\,\frac{4}{5} & \\
12 & . & 14 & . & 4\frac{3}{4}\,\frac{29}{100} & \\ \hline
\text{£}267 & . & 2 & . & 5\frac{1}{4}\,\frac{9}{100} & = \text{amount.}
\end{array}$$

6.
£. s. d.
415 . 10 . 0
$2\frac{1}{4}$
831 . 0 . 0
103 . 17 . 6
9·34 . 17 . 6
20
6·97*s.*
12
11·70*d.*

£. s. d.
9 . 6 . 11·7
4
£37 . 7 . 10·8 = simple interest.

£. s. d.
424 . 16 . 11·7 = 2nd principal
$2\frac{1}{4}$
849 . 13 . 11·4
106 . 4 . 2·925
9·55 . 18 . 2·325
20
11·18*s.*
12
2·18325*d.*

£. s. d.
434 . 8 . 1·88325 = 3rd principal
$2\frac{1}{4}$
868 . 16 . 3·7665
108 . 12 . 0·4708125
9·77 . 8 . 4·2373125
20
15·48*s.*
12
5·802373125*d.*

£. s. d.
444 . 3 . 7·685623125 = 4th principal
$2\frac{1}{4}$
888 . 7 . 3·37124625
111 . 0 . 10·92140578125
9·99 . 8 . 2·29265203125
20
19·88*s.*
12
10·5829265203125*d.*

£. s. d.
therefore, 9 . 6 . 11·7
9 . 11 . 2·18325
9 . 15 . 5·802373125
9 . 19 . 10·5829265203125
compound interest = 38 . 13 . 6·2685496453125
simple interest = 37 . 7 . 10·8
£1 . 5 . 7·4685496453125

= £1 5*s.* $7\frac{1}{2}$*d.* nearly.

7.
£. £.
1st payment = 130 $\times\frac{2}{100}$ = 2·6
2nd .... = 132·6 $\times\frac{2}{100}$ = 2·652
3rd .... = 135·252 $\times\frac{2}{100}$ = 2·70504
4th .... = 137·95704 $\times\frac{2}{100}$ = 2·7591408
5th .... = 140·7161808 $\times\frac{2}{100}$ = 2·814323616
6th .... = 143·530504416 $\times\frac{2}{100}$ = 2·87061008832
therefore, compound interest = 16·40111450432
20
8·02229008640*s.*
12
·26748103680*d.*

Ans. £16 8*s.* $0\frac{1}{4}$*d.* nearly.

8.

```
  £.     s.
 1760 . 10 = 1st principal
         4
 --------------
70·42 .  0
   20
 -----
 8·40s.
   12
 -----
 4·80d.
```

```
  £.     s.    d.
 1930 . 18 . 4·8 = 2nd principal
              4
 -------------------
73·23 . 13 . 7·2
   20
 -----
 4·73s.
   12
 -----
 8·832d.
```

```
  £.    s.    d.
 1904 . 3 . 1·632 = 3rd principal
                2
 ---------------------
38·08 . 6 . 3·264
   20
 -----
 1·66s.
   12
 ----------
 7·95264d.
```

```
          £.    s.    d.
        1904 . 3 . 1·632
          38 . 1 . 7·95264
       ---------------------
Ans. £1942 . 4 . 9·58464
```

9.

```
 £.
 230
  3½
 ----
 690
 115
 ----
8·05
  20
 ----
1·00s.
```

```
  £.    s.   d.
  230 . 0 . 0
  230 . 0 . 0
    8 . 1 . 0
 -------------
  468 . 1 . 0
             3½
 -------------
 1404 . 3 . 0
  234 . 0 . 6
 ---------------
16·38 . 3 . 6
   20
 -----
 7·63s.
   12
 -----
 7·62d.
```

```
        £.    s.   d.
       468 . 1 . 0
       230 . 0 . 0
        16 . 7 . 7·62
      ----------------
Ans. £714 . 8 . 7·62
```

10.

```
  £.     s.   d.
 416 . 13 . 4
            2½
 --------------
 833 .  6 . 8
 104 .  3 . 4
 --------------
9·37 . 10 . 0
  20
 -----
 7·50s.
   12
 -----
 6·00d.
```

```
  £.    s.    d.   q.
   9 .  7 . 6
   9 . 11 . 8½ ½
 ------------------
  18 . 19 . 2½ ½ = comp. interest
  18 . 15 . 0    = simple interest
 ------------------
   0 .  4 . 2½ ½ = difference.
```

```
 £.   s.   d.
  9 . 7 . 6
          2
 -------------
£18 . 15 . 0 = simple interest.
```

```
  £.    s.   d.
 426 .  0 . 10  = 2nd principal
            2½
 ----------------
 852 .  1 .  8
 106 . 10 .  2½
 ----------------
9·58 . 11 . 10½
   20
 -----
11·71s.
   12
 -----
 8·62d.
    4
 -----
 2·50q.
```

11.

$$\begin{array}{r}
\text{£.}\quad \text{s.}\quad \text{d.}\\
13333 \;.\; 6 \;.\; 8 = \text{1st principal}\\
5\\
\hline
666{\cdot}66 \;.\; 13 \;.\; 4\\
20\\
\hline
13{\cdot}33\textit{s}.\\
12\\
\hline
4{\cdot}00\textit{d}.
\end{array}
\qquad
\begin{array}{r}
\text{£.}\quad \text{s.}\quad \text{d.}\\
666 \;.\; 13 \;.\; 4\\
5\\
\hline
\text{£}3333 \;.\; 6 \;.\; 8 = \text{simple interest.}
\end{array}$$

$$\begin{array}{r}
\text{£.}\\
14000 = \text{2nd principal}\\
5\\
\hline
\text{£}700{\cdot}00
\end{array}$$

$$\begin{array}{r}
\text{£.}\\
14700 = \text{3rd principal}\\
5\\
\hline
\text{£}735{\cdot}00
\end{array}
\qquad
\begin{array}{r}
\text{£.}\\
15435 = \text{4th principal}\\
5\\
\hline
771{\cdot}75\\
20\\
\hline
15{\cdot}00\textit{s}.
\end{array}$$

$$\begin{array}{r}
\text{£.}\quad \text{s.}\\
16206 \;.\; 15 = \text{5th principal}\\
5\\
\hline
810{\cdot}33 \;.\; 15\\
20\\
\hline
6{\cdot}75\textit{s}.\\
12\\
\hline
9{\cdot}00\textit{d}.
\end{array}$$

$$\begin{array}{rr}
 & \text{£.}\quad \text{s.}\quad \text{d.}\\
\text{therefore, compound interest} = & 3683 \;.\; 15 \;.\; 1\\
\text{simple interest} = & 3333 \;.\; 6 \;.\; 8\\
\hline
\text{difference} = & 350 \;.\; 8 \;.\; 5
\end{array}$$

12.

$$\begin{array}{r}
\text{£.}\\
180 = \text{1st principal}\\
4\tfrac{1}{2}\\
\hline
720\\
90\\
\hline
8{\cdot}10\\
20\\
\hline
2{\cdot}00\textit{s}.
\end{array}
\qquad
\begin{array}{r}
\text{£.}\quad \text{s.}\\
188 \;.\; 2 = \text{2nd principal}\\
4\tfrac{1}{2}\\
\hline
752 \;.\; 8\\
94 \;.\; 1\\
\hline
8{\cdot}46 \;.\; 9\\
20\\
\hline
9{\cdot}29\textit{s}.\\
12\\
\hline
3{\cdot}48\textit{d}.
\end{array}$$

$$\begin{array}{r}
\text{£.}\quad \text{s.}\quad \text{d.}\\
196 \;.\; 11 \;.\; 3{\cdot}48 = \text{3rd principal}\\
4\tfrac{1}{2}\\
\hline
786 \;.\; 5 \;.\; 1{\cdot}92\\
98 \;.\; 5 \;.\; 7{\cdot}74\\
\hline
8{\cdot}84 \;.\; 10 \;.\; 9{\cdot}66\\
20\\
\hline
16{\cdot}90\textit{s}.\\
12\\
\hline
10{\cdot}8966\textit{d}.
\end{array}
\qquad
\begin{array}{r}
\text{£.}\quad \text{s.}\quad \text{d.}\\
196 \;.\; 11 \;.\; 3{\cdot}48\\
8 \;.\; 16 \;.\; 10{\cdot}8966\\
\hline
\text{£}205 \;.\; 8 \;.\; 2{\cdot}3766 = \text{amount required.}
\end{array}$$

13. £100, at compound interest, will amount in 2 years to £110 5*s.*;

therefore, £110¼ : £100 :: £100 : sum required;

$$\text{therefore, sum required} = £\,\frac{100\times100\times4}{441} = £90\ 14\tfrac{26}{441}s.$$

14. £100, at compound interest, will amount in 2 years to £110 5*s.*;

therefore, £110¼ : £100 :: £264⅝ : sum required;

$$\text{therefore, sum required} = £\,\frac{100\times1323\times4}{5\times441} = £240.$$

15.

$$\begin{array}{r}
£.\\
256\\
\underline{4\frac{1}{2}}\\
1024\\
\underline{128}\\
11{\cdot}52\\
\underline{20}\\
10{\cdot}40s.\\
\underline{12}\\
4{\cdot}80d.
\end{array}
\qquad\qquad
\begin{array}{rcrcrl}
£. & & s. & & d. & \\
11 & . & 10 & . & 4{\cdot}8 & \\
 & & & & \underline{3} & \\
£34 & . & 11 & . & 2{\cdot}4 & \text{simple interest.}
\end{array}$$

$$\begin{array}{rcrcrl}
£. & & s. & & d. & \\
267 & . & 10 & . & 4{\cdot}8 & = \text{2nd principal}\\
 & & & & \underline{4\frac{1}{2}} & \\
1070 & . & 1 & . & 7{\cdot}2 & \\
133 & . & 15 & . & 2{\cdot}4 & \\
\hline
12{\cdot}03 & . & 16 & . & 9{\cdot}6 & \\
\underline{20} & & & & & \\
0{\cdot}76s. & & & & & \\
\underline{12} & & & & & \\
9{\cdot}216d. & & & & &
\end{array}
\qquad
\begin{array}{rcrcrl}
£. & & s. & & d. & \\
279 & . & 11 & . & 2{\cdot}016 & = \text{3rd principal}\\
 & & & & \underline{4\frac{1}{2}} & \\
1118 & . & 4 & . & 8{\cdot}064 & \\
139 & . & 15 & . & 7{\cdot}008 & \\
\hline
12{\cdot}58 & . & 0 & . & 3{\cdot}072 & \\
\underline{20} & & & & & \\
11{\cdot}60s. & & & & & \\
\underline{12} & & & & & \\
7{\cdot}23072d. & & & & &
\end{array}$$

$$\begin{array}{lrcrcrl}
 & £. & & s. & & d. & \\
\therefore & 36 & . & 2 & . & 9{\cdot}24672 & \text{compound interest}\\
 & 34 & . & 11 & . & 2{\cdot}4 & \text{simple interest}\\
\hline
 & £\ 1 & . & 11 & . & 6{\cdot}84672 &
\end{array}
\qquad
\begin{array}{r|l}
\text{and } 12 & 6{\cdot}84672\\
\hline
2{,}0 & 11{\cdot}57056\\
\hline
\textit{Ans.} & £1{\cdot}578528
\end{array}$$

DISCOUNT.

Ex. LXI. (p. 236.)

1. (1) £105 : £283 10*s.* :: £100 : present worth;

$$\text{therefore, present worth} = £\,\frac{567\times100}{105\times2} = £270.$$

(2) £103 5*s.* : £252 19*s.* 3*d.* :: £100 : present worth;

therefore, present worth $= £\dfrac{60711 \times 100}{24780} = £245.$

(3) £101½ : £676⅔ :: £100 : present worth;

therefore, present worth $= £\dfrac{2030 \times 100 \times 2}{3 \times 203} = £666$ 13*s.* 4*d.*

(4) £101¾ : £284$\frac{9}{10}$ :: £100 : present worth;

therefore, present worth $= £\dfrac{2849 \times 100 \times 4}{10 \times 407} = £280.$

(5) £102⅓ : £460½ :: £100 : present worth;

therefore, present worth $= £\dfrac{921 \times 100 \times 3}{2 \times 307} = £450.$

(6) £101$\frac{43}{48}$: £390 :: £100 : present worth;

therefore, present worth $= £\dfrac{390 \times 100 \times 48}{4891} = £382$ 14*s.* 10$\frac{2522}{4891}$*d.*

(7) £102½ : £572 :: £100 : present worth;

therefore, present worth $= £\dfrac{572 \times 2 \times 100}{205} = £558$ 0*s.* 11$\frac{29}{41}$*d.*

(8) £100$\frac{1}{12}$: £1261$\frac{1}{20}$ :: £100 : present worth;

therefore, present worth $= £\dfrac{25221 \times 100 \times 12}{1201 \times 20} = £1260.$

(9) £101½ : £35 :: £100 : present worth;

therefore, present worth $= £\dfrac{35 \times 100 \times 2}{203} = £34$ 9*s.* 7$\frac{25}{29}$*d.*

(10) £100⅞ : £1250 :: £100 : present worth;

therefore, present worth $= £\dfrac{1250 \times 100 \times 8}{807} = £1239$ 3*s.* 1$\frac{621}{807}$*d.*

(11) £105½ : £2110 :: £100 : present worth;

therefore, present worth $= £\dfrac{2110 \times 100 \times 2}{211} = £2000.$

(12) £105 : £275⅓ :: £100 : present worth;

therefore, present worth $= £\dfrac{826 \times 100}{105 \times 3} = £262$ 4*s.* 5¼*d.* ⅓*q.*

(13) £120 : £918 :: £100 : present worth;

therefore, present worth $= £\,\dfrac{918 \times 100}{120} = £765.$

(14) £$108\frac{11}{96}$: £500 :: £100 : present worth;

therefore, present worth $= £\,\dfrac{500 \times 100 \times 96}{10379} = £462\ 9s.\ 5\frac{3653}{10379}d.$

(15) £210 : £840 :: £100 : present worth;

therefore, present worth $= £\,\dfrac{840 \times 100}{210} = £400.$

(16) £112 9*s*. 8·736*d*. : £2197 :: £100 : present worth;
therefore, present worth

$$= £\,\frac{527280 \times 100}{26996{\cdot}736} = £\,\frac{527280 \times 100 \times 1000}{26996736} = £\,\frac{15625}{8} = £1953\ 2s.\ 6d.$$

2. (1) £$101\frac{1}{3}$: £$63\frac{1}{3}$ :: £$1\frac{1}{3}$: discount;

therefore, discount $= £\,\dfrac{190 \times 4 \times 3}{304 \times 3 \times 3} = £\,\dfrac{5}{6} = 16s.\ 8d.$

(2) £$102\frac{1}{4}$: £$1380\frac{3}{8}$ :: £$2\frac{1}{4}$: discount;

therefore, discount $= £\,\dfrac{11043 \times 9 \times 4}{409 \times 8 \times 4} = £30\ 7s.\ 6d.$

(3) £$102\frac{1}{2}$: £$107\frac{1}{4}$ :: £$2\frac{1}{2}$: discount;

therefore, discount $= £\,\dfrac{429 \times 5 \times 2}{205 \times 4 \times 2} = £2\ 12s.\ 3\frac{33}{41}d.$

(4) £$100\frac{7}{8}$: £$125\frac{1}{2}$ :: £$\frac{7}{8}$: discount;

therefore, discount $= £\,\dfrac{251 \times 7 \times 8}{2 \times 8 \times 807} = £1\ 1s.\ 9\frac{213}{807}d.$

(5) £$101\frac{11}{24}$: £487 :: £$1\frac{11}{24}$: discount;

therefore, discount $= £\,\dfrac{487 \times 35 \times 24}{24 \times 2435} = £7.$

(6) £$101\frac{2}{3}$: £340 :: £$1\frac{2}{3}$: discount;

therefore, discount $= £\,\dfrac{340 \times 5 \times 3}{305 \times 3} = £5\ 11s.\ 5\frac{43}{61}d.$

(7) £104 : £3640 :: £4 : discount;

therefore, discount $= £\,\dfrac{3640 \times 4}{104} = £140.$

(8) £$106\frac{1}{3}$: £$813\frac{9}{20}$ :: £$6\frac{1}{3}$: discount;

therefore, discount $= £\,\dfrac{16269 \times 19 \times 3}{20 \times 3 \times 319} = £\,\dfrac{969}{20} =$ £48 9*s*.

(9) £$107\frac{1}{12}$: £$250\frac{3}{4}$ :: £$7\frac{1}{12}$: discount;

therefore, discount $= \dfrac{1003 \times 85 \times 12}{4 \times 12 \times 1285} =$ £16 11*s*. $8\frac{200}{257}$*d*.

(10) £$101\frac{9}{10}$: £55 :: £$1\frac{9}{10}$: discount;

therefore, discount $= £\,\dfrac{55 \times 19 \times 10}{1019 \times 10} =$ £1 0*s*. $6\frac{126}{1019}$*d*.

(11) £100 : £649 :: £$1\frac{763}{1460}$: interest on £649;

therefore, interest $= £\,\dfrac{649 \times 2223}{100 \times 1460} =$ £9 17*s*. $7\frac{1106}{1825}$*d*.

Again, £$101\frac{763}{1460}$: £649 :: £$1\frac{763}{1460}$: discount;

therefore, discount $= \dfrac{649 \times 2223 \times 1460}{1460 \times 148223} =$ £9 14*s*. $8\frac{5552}{148223}$*d*.

therefore, banker's gain $=$ 2*s*. 11*d*. nearly.

(12) £$100\frac{1127}{1460}$: £100 :: £$\frac{1127}{1460}$: discount;

therefore, discount $= £\,\dfrac{112700 \times 1460}{147127 \times 1460} =$ 15*s*. $3\frac{123759}{147127}$*d*.

(13) £100 : £545 :: £7 : interest;

therefore, interest $= £\,\dfrac{545 \times 7}{100} =$ £38 3*s*.

Again, £107 : £$583\frac{3}{20}$ :: £7 : discount;

therefore, discount $= £\,\dfrac{11663 \times 7}{20 \times 107} = £\,\dfrac{763}{20} =$ £38 3*s*.

(14) $\frac{1}{5}$ of the sum is the price of one volume at the end of a year, and $\frac{1}{6}$ of the sum is the present price;

therefore, $\frac{1}{5} - \frac{1}{6} = \frac{1}{30}$ of given sum is the allowance made per volume;

therefore, allowance on 5 volumes $= \frac{5}{30} = \frac{1}{6}$ of the sum;

therefore, 1 : $\frac{1}{6}$ :: 100 : rate of discount;

therefore, rate of discount $= \frac{100}{6} = 16\frac{2}{3}$ per cent.

(15) £105 : £100 :: £$2\frac{9}{20}$: cash price;

therefore, cash price $= £\,\dfrac{100 \times 49}{105 \times 20} = £\frac{7}{3} =$ £2 6*s*. 8*d*.

STOCKS.

Ex. LXII. (p. 240.)

1. (1) £75 : £2850 :: £100 : stock required;

$$\text{therefore, stock required} = £\,\frac{2850 \times 100}{75} = £3800.$$

(2) £89 : £712 :: £100 : stock required;

$$\text{therefore, stock required} = £\,\frac{712 \times 100}{89} = £800.$$

(3) £96 : £504 :: £100 : stock required;

$$\text{therefore, stock required} = £\,\frac{504 \times 100}{96} = £525.$$

(4) £93 : £883 5 f. :: £100 : stock required;

$$\text{therefore, stock required} = £\,\frac{8835 \times 100}{930} = £950.$$

(5) £87 : £3741 :: £100 : stock required;

$$\text{therefore, stock required} = £\,\frac{3741 \times 100}{87} = £4300.$$

(6) £$83\frac{3}{4}$: £500 :: £100 : stock required;

$$\text{therefore, stock required} = £\,\frac{500 \times 100 \times 4}{335} = £597\ 0s.\ 3\tfrac{38}{67}d.$$

(7) £$75\frac{1}{2}$: £800 :: £100 : stock required;

$$\text{therefore, stock required} = £\,\frac{800 \times 100 \times 2}{151} = £1059\ 12\tfrac{8}{151}s.$$

(8) £$85\frac{3}{8}$: £4311 8*s*. 9*d*. :: £100 : stock required;

$$\text{therefore, stock required} = £\,\frac{1034745 \times 100}{20490} = £5050.$$

(9) £94 : £2100 :: £100 : stock required;

$$\text{therefore, stock required} = £\,\frac{2100 \times 100}{94} = £2234\tfrac{2}{47}.$$

(10) £$90\frac{1}{2}$: £2353 :: £100 : stock required;

$$\text{therefore, stock required} = £\,\frac{2353 \times 100 \times 2}{181} = £2600.$$

(11) £106 : £3277 :: £100 : stock required;

$$\text{therefore, stock required} = \pounds\,\frac{3277 \times 100}{106} = \pounds 3091\ 10s.\ 2\tfrac{14}{53}d.$$

(12) £99⅜ : £10500 :: £100 : stock required;

$$\text{therefore, stock required} = \pounds\,\frac{10500 \times 100 \times 8}{795} = \pounds 10566\ 0s.\ 9\tfrac{3}{53}d.$$

2. (1) £100 : £2600 :: £93 : value required;

$$\text{therefore, value required} = \pounds\,\frac{2600 \times 93}{100} = \pounds 2418.$$

(2) £100 : £1920 :: £77½ : value required;

$$\text{therefore, value required} = \pounds\,\frac{1920 \times 155}{100 \times 2} = \pounds 1488.$$

(3) £100 : £3000 :: £92½ : value required;

$$\text{therefore, value required} = \pounds\,\frac{3000 \times 185}{100 \times 2} = \pounds 2775.$$

(4) £100 : £2240 :: £81⅞ : value required;

$$\text{therefore, value required} = \pounds\,\frac{2240 \times 655}{100 \times 8} = \pounds 1834.$$

(5) £100 : £3416 :: £89 : value required;

$$\text{therefore, value required} = \pounds\,\frac{3416 \times 89}{100} = \pounds 3040\ 4s.\ 9\tfrac{3}{5}d.$$

(6) £100 : £1743 :: £82⅞ : value required;

$$\text{therefore, value required} = \frac{1743 \times 663}{100 \times 8} = \pounds 1444\ 10s.\ 2\tfrac{1}{2}d.\ \tfrac{4}{5}q.$$

(7) £100 : £2675 :: £91⅗ : value required;

$$\text{therefore, value required} = \frac{2675 \times 458}{100 \times 5} = \pounds 2450\ 6s.$$

(8) £100 : £1000 :: £97¼ : value required;

$$\text{therefore, value required} = \frac{1000 \times 389}{100 \times 4} = \pounds 972\ 10s.$$

(9) £100 : £2153½ :: £188¾ : value required;

$$\text{therefore, value required} = \frac{4307 \times 755}{2 \times 100 \times 4} = \pounds 4064\ 14s.\ 7\tfrac{1}{2}d.$$

3. (1) £84 : £1008 :: £3 : income required;

$$\text{therefore, income} = £\,\frac{1008 \times 3}{84} = £36.$$

(2) £93 : £5580 :: £4 : income required;

$$\text{therefore, income} = £\,\frac{5580 \times 4}{93} = £240.$$

(3) £92 : £1138 5 f. :: £4 5 f. : income required;

$$\text{therefore, income} = \frac{11385 \times 45}{920}\,\text{fl.} = £55\ 6\,\text{f.}\ 8\,\text{c.}\ 7\tfrac{1}{2}\,\text{m.}$$

(4) £93$\frac{3}{5}$: £1638 :: £4$\frac{1}{2}$: income required;

$$\text{therefore, income} = £\,\frac{1638 \times 9 \times 5}{468 \times 2} = £78\ 15s.$$

(5) £88$\frac{1}{2}$: £2000 :: £3 : income required;

$$\text{therefore, income} = £\,\frac{2000 \times 3 \times 2}{177} = £67\ 15s.\ 11\tfrac{11}{59}d.$$

(6) £91$\frac{3}{4}$: £3425 15s. 2d. :: £3 : income required;

$$\text{therefore, income} = \frac{822182 \times 3}{22020}\,d. = £112\ 0s.\ 3\tfrac{123}{367}d.$$

(7) £105 : £4788 :: £3$\frac{1}{2}$: income required;

$$\text{therefore, income} = £\,\frac{4788 \times 7}{105 \times 2} = £159\ 12s.$$

(8) £94$\frac{1}{4}$: £3500 :: £3 : income required;

$$\text{therefore, income} = £\,\frac{3500 \times 3 \times 4}{377} = £111\ 8s.\ 1\tfrac{151}{377}d.$$

(9) £102$\frac{19}{24}$: £5250 :: £3$\frac{1}{2}$: income required;

$$\text{therefore, income} = £\,\frac{5250 \times 7 \times 24}{2 \times 2467} = £178\ 15s.\ 2\tfrac{766}{2467}d.$$

4. (1) £3 : £60 :: £85 : sum required;

$$\text{therefore, sum required} = £\,\frac{60 \times 85}{3} = £1700.$$

(2) £3 : £67 :: £288 : sum required;

$$\text{therefore, sum required} = £\,\frac{288 \times 67}{3} = £6432.$$

(3) **£3$\frac{1}{2}$: £70 :: £90 : sum required;**

$$\text{therefore, sum required} = £\,\frac{90\times70\times2}{7} = £1800.$$

(4) **£4 5 f. : £83 2 f. 5 c. :: £94 : sum required;**

$$\text{therefore, sum required} = £\,\frac{8325\times94}{450} = £1739.$$

(5) **£3 : £87 :: £74$\frac{5}{8}$: sum required;**

$$\text{therefore, sum required} = £\,\frac{87\times597}{3\times8} = £2164\ 2s.\ 6d.$$

(6) **£4 : £37$\frac{1}{2}$ :: £93$\frac{3}{8}$: sum required;**

$$\text{therefore, sum required} = £\,\frac{75\times747}{4\times2\times8} = £875\ 7s.\ 9\frac{3}{4}d.$$

5. (1) **£91 : £100 :: £3 : interest required;**

$$\text{therefore, interest} = £\,\frac{3\times100}{91} = £3\ 5s.\ 11\frac{19}{91}d.$$

(2) **£94 : £100 :: £3$\frac{1}{2}$: interest required;**

$$\text{therefore, interest} = £\,\frac{100\times7}{94\times2} = £3\ 14s.\ 5\frac{29}{47}d.$$

(3) **£96$\frac{5}{8}$: £100 :: £4$\frac{1}{2}$: interest required;**

$$\text{therefore, interest} = £\,\frac{100\times9\times8}{773\times2} = £4\ 13s.\ 1\frac{559}{773}d.$$

(4) **£103 : £100 :: £5 : interest required;**

$$\text{therefore, interest} = £\,\frac{100\times5}{103} = £4\ 17s.\ 1\frac{5}{103}d.$$

6. **£94$\frac{3}{8}$: £7927$\frac{1}{2}$ :: £2 18s. 3d. : net income;**

$$\text{therefore, net income} = \frac{15855\times699\times8}{2\times755}\,d. = £244\ 13s.$$

7. **£90 : £100 :: £3 : rate per cent.; therefore, rate per cent. = £3$\frac{1}{3}$;**
£80 : £100 :: £3 : rate per cent.; therefore, rate per cent. = £3$\frac{3}{4}$;

$$\text{therefore, advantage} = £3\ 15s. - £3\ 6s.\ 8d. = 8s.\ 4d.$$

8. £98 : £800 :: £3 : income on $\frac{2}{5}$ of £2000;

£100 : £1200 :: £$3\frac{1}{2}$: income on remainder of £2000;

$$\text{therefore, 1st income} = £\,\frac{800\times 3}{98} = \overset{£.}{24} \,.\, \overset{s.}{9} \,.\, \overset{d.}{9\tfrac{27}{49}}$$

$$\text{2nd income} = £\,\frac{1200\times 7}{100\times 2} = 42 \,.\, 0 \,.\, 0$$

$$\text{therefore, whole income} = \overline{66 \,.\, 9 \,.\, 9\tfrac{27}{49}}$$

9. £$4\frac{1}{2}$: £$3\frac{1}{2}$ :: £100 : price of stock;

$$\text{therefore, price of stock} = £\,\frac{100\times 7\times 2}{9\times 2} = £77\tfrac{7}{9},$$

and £$77\frac{7}{9}$: £1200 :: £100 : quantity of stock;

$$\text{therefore, quantity of stock} = £\,\frac{1200\times 100\times 9}{700} = £1542\ 17s.\ 1\tfrac{5}{7}d.$$

10. £99 : £90 :: £1100 : amount required;

$$\text{therefore, amount} = £\,\frac{90\times 1100}{99} = £1000.$$

11. £100 : £500 :: £$4\frac{1}{4}$: whole gain;

$$\text{therefore, whole gain} = £\,\frac{500\times 17}{100\times 4} = £21\ 5s.$$

12. £81 : £9450 :: £$13\frac{1}{2}$: loss required;

$$\text{therefore, loss} = £\,\frac{9450\times 27}{81\times 2} = £1575.$$

13. £3 : £$3\frac{1}{2}$ :: £$89\frac{1}{2}$: price required;

$$\text{therefore, price} = £\,\frac{7\times 179}{3\times 2\times 2} = £104\ 8s.\ 4d.$$

14. £$88\frac{3}{8}$: £$\frac{1000}{3}$ :: £$1\frac{1}{2}$: half-yearly income;

$$\text{therefore, income} = £\,\frac{1000\times 3\times 8}{3\times 2\times 707} = £5\ 13s.\ 1\tfrac{601}{707}d.$$

15. £100 : £1000 :: £4 : 1st income; therefore, 1st income = £40;

£100 : £1000 :: £90 : value of 4 per cent. stock;

$$\text{therefore, value of 4 per cent. stock} = £\,\frac{1000\times 90}{100} = £900.$$

and £72 : £900 : £3 : income from 3 per cents.;

$$\text{therefore, 2nd income} = £\,\frac{900\times 3}{72} = £37\ 10s.;$$

therefore, difference in his income = £40 − £37 10s. = £2 10s.

16. £100 : £5000 :: £$3\frac{1}{2}$: income from £5000 stock;

$$\text{therefore, 1st income} = £\,\frac{5000 \times 7}{100 \times 2} = £175.$$

£$102\frac{2}{3}$: £5000 :: £$3\frac{1}{2}$: income from investment;

$$\text{therefore, 2nd income} = £\,\frac{5000 \times 7 \times 3}{2 \times 308} = £170\ 9s.\ 1\tfrac{1}{11}d.$$

17. £100 : £12600 :: £3 : income; therefore, income = £378;

£100 : £12600 :: £95 : value of stock; therefore, value = £11970.

18. £$98\frac{1}{4}$: £$89\frac{3}{8}$ :: £3000 : quantity of $3\frac{1}{2}$ per cent. stock;

$$\text{therefore, quantity of stock} = £\,\frac{715 \times 3000 \times 4}{393 \times 8} = £2729\tfrac{1}{131};$$

£100 : £$2729\frac{1}{131}$ :: £$3\frac{1}{2}$: income from $3\frac{1}{2}$ per cents.;

$$\begin{array}{lrrrr} & & £. & s. & d. \\ \text{therefore, 2nd income} = £\,\dfrac{357500 \times 7}{131 \times 2 \times 100} & = & 95\ . & 10\ . & 3\tfrac{87}{131} \\ \text{and 1st income} = £\,\dfrac{3000 \times 3}{100} & = & 90\ . & 0\ . & 0 \\ \hline \text{therefore, alteration in his income} & = & 5\ . & 10\ . & 3\tfrac{87}{131} \end{array}$$

19. In the 3 per cents. at $90\frac{1}{2}$, £1 gives £$\frac{3}{90\frac{1}{2}}$ interest, or £$\frac{6}{181}$.

In the 4 per cents. at 101, £1 gives £$\frac{4}{101}$ interest;

and, since $\frac{4}{101}$ is greater than $\frac{6}{181}$, the latter investment is the better.

20. £83 : £$1037\frac{1}{2}$ :: £100 : quantity of 3 per cent. stock;

$$\text{therefore, quantity of 3 per cent. stock} = £\,\frac{2075 \times 100}{83 \times 2} = £1250;$$

£96 : £84 :: £1250 : quantity of 4 per cent. stock;

$$\text{therefore, quantity of 4 per cent. stock} = £\,\frac{1250 \times 84}{96} = £1093\tfrac{3}{4};$$

therefore, £100 : £1250 :: £3 : 1st income, or 1st income = £37 10*s*.,

£100 : £$1093\frac{3}{4}$ :: £4 : 2nd income, or 2nd income = £43 15*s*.;

therefore, difference of income = £43 15*s*. − £37 10*s*. = £6 5*s*.

21. In 1st stock £1 gives $£\frac{3\frac{1}{2}}{96}$, or $£\frac{7}{192}$ interest.

In 2nd .... $£\frac{4}{111}$ interest;

therefore, since 7×111 is greater than 4×192, the 3½ per cents. is the better investment,

$$\text{and difference} = £\left(\frac{7}{192} - \frac{4}{111}\right) = £\frac{9}{192 \times 111};$$

$$\text{therefore, difference per cent.} = £\frac{900}{192 \times 111} = 10\tfrac{5}{37}d.$$

22. £96 : £512 :: £1½ : half-yearly income;

$$\text{therefore, half-yearly income} = £\frac{512 \times 3}{96 \times 2} = £8.$$

and income-tax $= (8 \times 7)d. = 4s.\ 8d.$;

therefore, net income $= £8 - 4s.\ 8d. = £7\ 15s.\ 4d.$

23. £103⅜ : £100 :: £1654 : present worth;

$$\text{therefore, present worth} = £\frac{100 \times 1654 \times 8}{827} = £1600.$$

therefore, £96 : £1600 :: £100 : quantity of stock required;

$$\text{therefore, quantity of stock} = £\frac{1600 \times 100}{96} = £1666\ 13s.\ 4d.$$

24. Interest on £1 in 3½ per cents. $= £\frac{3\frac{1}{2}}{87} = £\frac{7}{174}$.

.... 3¾ shares $= £\frac{3\frac{3}{4}}{89} = £\frac{15}{356}$.

Hence, since 15×174 is greater than 7×356, the railway shares are the better investment.

25. £100 : £2950 :: £3 : income from 3 per cents.;

$$\text{therefore, 1st income} = £\frac{2950 \times 3}{100} = £88\ 10s.,$$

£108 : £81 :: £2950 : quantity of 5 per cent. stock;

therefore, quantity of 5 per cent. stock $= £2212\frac{1}{2}$,

£100 : £2212½ :: £5 : 2nd income;

$$\text{therefore, 2nd income} = £\frac{4425 \times 5}{2 \times 100} = £110\ 12s.\ 6d.$$

Hence, difference $= £110\ 12s.\ 6d. - £88\ 10s. = £22\ 2s.\ 6d.$

26. £1 in 3 per cents. gives £ $\frac{3}{87\frac{3}{8}}$, or £ $\frac{24}{699}$ interest.

£1 in $7\frac{2}{3}$ shares gives £ $\frac{7\frac{2}{3}}{233}$, or £ $\frac{23}{699}$ interest;

therefore, the 3 per cents. are the better investment.

Also £3 : £460 :: £$87\frac{3}{8}$: sum to be invested; ∴ 1st sum = £13397 10*s*.,

£$\frac{23}{699}$: £460 :: £1 : 2nd investment; ∴ 2nd sum = £13980.

27. $(3\frac{1}{2} \times 7)$*d*. = 2*s*. $0\frac{1}{2}$*d*. = income-tax on £100 stock;

therefore, net income on £100 stock = £3 10*s*. − 2*s*. $0\frac{1}{2}$*d*. = £3 7*s*. $11\frac{1}{2}$*d*.;

therefore, £3 7*s*. $11\frac{1}{2}$*d*. : £460 :: £91 : sum required;

therefore, sum required = £ $\frac{441600 \times 91}{3262}$ = £12319 6*s*. $3\frac{45}{233}$*d*.

28. In 13 years the dividend on £100 stock, at 3 per cent., was £(3 × 13) = £39;

∴ £39 : £3081 :: £100 : amount of stock; ∴ stock = £7900,

and £100 : £7900 :: £$79\frac{7}{8}$: value of stock; ∴ value = £6310 2*s*. 6*d*.

29. £100 : £3200 :: £3 : 1st income; ∴ 1st income = £96,

£100 : £3200 :: £$99\frac{3}{4}$: value of stock; ∴ value = £3192,

£100 : £45 :: £5 : int. per share; ∴ int. per share = £$2\frac{1}{4}$,

£56 : £3192 :: £$2\frac{1}{4}$: 2nd income; ∴ 2nd income = £128 5*s*.;

therefore, difference of income = £128 5*s*. − £96 = £32 5*s*.

30. £$79\frac{5}{8}$: £1911 :: £100 : stock bought; therefore, stock bought = £2400,

and stock must be sold for £1911 + £150 = £2061;

therefore, £2400 : £100 :: £2061 : price of stock; therefore, price = £$85\frac{7}{8}$;

therefore, to pay the brokerage, the price must be £$(85\frac{7}{8} + \frac{1}{8})$, or £86.

31. Income from South Sea Annuities = £300,

£100 : £110 :: £10000 : amount of $2\frac{1}{2}$ stock;

therefore, amount of $2\frac{1}{2}$ stock = £11000;

therefore, income from $2\frac{1}{2}$ stock = £$(110 \times 2\frac{1}{2})$ = £275;

therefore, loss of income from accepting this stock = £25.

Again, £93 : £10000 :: £3 : income from investment in consols;

therefore, income from consols = £322 11*s*. $7\frac{11}{31}$*d*.;

therefore, gain by investing in consols = £22 11*s*. $7\frac{11}{31}$*d*.

32. £100 : £4000000 :: £$\frac{1}{2}$: saving; therefore, saving = £20000,

£100 : £4000000 :: £$5\frac{5}{8}$: loss of fundholders;

therefore, loss = £ $\frac{4000000 \times 45}{100 \times 8}$ = £225,000.

PROFIT AND LOSS.

Ex. LXIII. (p. 246.)

1. Gain per cwt. = £2 0*s*. 8*d*. − £1 12*s*. = 8*s*. 8*d*.;

∴ 1 cwt. : 5 cwt. 3 qrs. 14 lbs. :: 8*s*. 8*d*. : whole gain;

$$\therefore \text{ whole gain} = \frac{47 \times 104}{8} d. = \pounds 2\ 10s.\ 11d.$$

2. Gain on whole = £11 18*s*. 11*d*. − £9 8*s*. = £2 10*s*. 11*d*.;

∴ 5 cwt. 3 qrs. 14 lbs. : 1 cwt. :: £2 10*s*. 11*d*. : gain per cwt.;

$$\therefore \text{ gain per cwt.} = \frac{8 \times 611}{47} d. = 8s.\ 8d.$$

3.

	£.	s.	d.		£.	s.	d.
43 articles at	4	6	8	each cost	186	6	8
57	11	8	6	....	651	4	6
4	13	15	4	....	55	1	4
∴ 104				cost	892	12	6

Again 3 : 104 :: 28£ : price the articles sold for;

$$\therefore \text{ price of selling} = \frac{104 \times 28}{3} \pounds. = \pounds 970\ 13s.\ 4d.;$$

∴ gain = £970 13*s*. 4*d*. − £892 12*s*. 6*d*. = £78 0*s*. 10*d*.

4. 300 yds. at 5*s*. 6*d*. bring £82 10*s*.,

100 yds. at 2*s*. £10 0*s*.;

∴ the silk sells for £92 10*s*.

Hence gain = £92 10*s*. − £80 = £12 10*s*.;

∴ 80 : 100 :: £12 10*s*. : gain per cent.;

$$\therefore \text{ gain per cent.} = \frac{100 \times 25}{80 \times 2} \pounds. = \pounds 15\ 12s.\ 6d.$$

5.

cwt.		d.			£.	s.
2	of sugar at	6	per lb.	=	5	12
4	....	4½	....	=	8	8
3	....	5½	....	=	7	14;

∴ he must sell the remaining 3 cwt. for

£14 − £7 14*s*., or, for £6 6*s*.

Hence 3 cwt : 1 lb. :: £6 6*s*. : price per lb.

$$\therefore \text{ price per lb.} = \frac{126 \times 12}{3 \times 112} d. = 4\tfrac{1}{2}d.$$

6. The commodity sells for 896*d.* per cwt.,

.... costs ... 821*d.* ....

$\therefore$ an outlay of 821*d.* gains 75*d.*

Hence 821*d.* : 75*d.* :: £100 : gain per cent.;

$$\therefore \text{gain per cent.} = \frac{75 \times 100}{821}\,£. = £9\ 2s.\ 8\tfrac{368}{821}d.$$

7. The goods cost $(6\tfrac{1}{2} \times 112)\,d.$ or 728*d.* per cwt.,

.... sold for .... 1080*d.* ....

$\therefore$ an outlay of 728*d.* gained 352*d.*

Hence 728*d.* : 352*d.* :: £100 : gain per cent.;

$$\therefore \text{gain per cent.} = \frac{100 \times 352}{728}\,£. = \frac{100 \times 44}{91}\,£. = £48\ 7s.\ 0\tfrac{1}{4}d.\ \tfrac{53}{91}q.$$

8. An outlay of 3*s.* 6*d.* gained 4½*d.*;

$\therefore$ 3*s.* 6*d.* : 4½*d.* :: £100 : gain per cent.;

$$\therefore \text{gain per cent.} = \frac{9 \times 100}{2 \times 42}\,£. = £10\ 14s.\ 3\tfrac{1}{4}d.\ \tfrac{5}{7}q.$$

9. £122$\tfrac{38}{41}$: £100 :: £12$\tfrac{3}{5}$: cost price;

$$\therefore \text{cost price} = \frac{100 \times 63 \times 41}{5 \times 5040}\,£. = £10\ 5s.$$

10. Cost price = 22*s.* − 5*s.* 6*d.* = 16*s.* 6*d.*;

$\therefore$ 16*s.* 6*d.* : 5*s.* 6*d.* :: £100 : gain per cent.;

$$\therefore \text{gain per cent.} = \frac{11 \times 100}{33}\,£. = £33\ 6s.$$

11. £82 : £100 :: £24$\tfrac{3}{5}$: cost price;

$$\therefore \text{cost price} = \frac{100 \times 123}{82 \times 5}\,£. = £30.$$

12. £95 : £100 :: 5*s.* : cost price;

$$\therefore \text{cost price} = \frac{100 \times 5}{95}\,s. = 5s.\ 3\tfrac{3}{19}d.$$

Again, 100 : 104½ :: 5*s.* 3$\tfrac{3}{19}$*d.* : required price;

$$\therefore \text{price required} = \frac{209 \times 1200}{100 \times 2 \times 19}\,d. = 66d. = 5s.\ 6d.$$

13. $$\text{Expense of sale} = \frac{1}{20} \text{ of } 6s.\ 8d. = 4d.;$$

$$\therefore \text{ whole outlay} = 6s.\ 8d. + 4d. = 7s.,$$

$$\text{and } \pounds 100 : \pounds 125 :: 7s. : \text{selling price};$$

$$\therefore \text{ selling price} = \frac{125 \times 7}{100} s. = 8s.\ 9d.$$

14. $$\pounds 92 : \pounds 100 :: \pounds 25\tfrac{1}{2} : \text{cost price};$$

$$\therefore \text{ cost price} = \frac{100 \times 51}{92 \times 2} \pounds. = \pounds 27\tfrac{33}{46}.$$

$$\text{Hence} \qquad \text{gain if sold for } \pounds 38 = \pounds 10\tfrac{13}{46};$$

$$\therefore \pounds 27\tfrac{33}{46} : \pounds 10\tfrac{13}{46} :: \pounds 100 : \text{gain per cent.},$$

$$\text{or, gain per cent.} = \frac{473 \times 100 \times 46}{46 \times 1275} \pounds. = \frac{1892}{51} \pounds. = \pounds 37\ 1s.\ 11\tfrac{1}{2}d.\ \tfrac{2}{17}q.$$

15. $$\text{Cost per head} = \pounds 2\ 2s. + 5s.\ 6d. = \pounds 2\ 7s.\ 6d.;$$

$$\therefore \text{ gain per head} = \pounds 2\ 8s.\ 6d. - \pounds 2\ 7s.\ 6d. = 1s.;$$

$$\therefore \text{ whole gain} = 500s. = \pounds 25.$$

$$\text{Also} \qquad \pounds 2\tfrac{3}{8} : \pounds \frac{1}{20} :: \pounds 100 : \text{rate per cent.};$$

$$\therefore \text{ rate per cent.} = \frac{100 \times 8}{20 \times 19} \pounds. = \pounds 2\ 2s.\ 1\tfrac{1}{4}d.\ \tfrac{1}{19}q.$$

16. $$\pounds 100 : \pounds 120 :: \pounds 40 : \text{selling price with 20 per cent. profit};$$

$$\therefore \text{ selling price} = \frac{120 \times 40}{100} \pounds. = \pounds 48.$$

$$\text{Also } \pounds 100 : \pounds 105 :: \pounds 20 : \text{selling price of } \pounds 20 \text{ with 5 per cent. profit};$$

$$\therefore \text{ he sells half for } \frac{105 \times 20}{100} \pounds. \text{ or } \pounds 21.$$

Hence remainder must be sold for £48 – £21 or £27.

17. $$\text{The wine cost } (36 \times 10)s. = \pounds 18;$$

$$\therefore \pounds 100 : \pounds 120 :: \pounds 18 : \text{selling price};$$

$$\therefore \text{ selling price} = \frac{120 \times 18}{100} \pounds. = \pounds 21.\ 12s.$$

$$\text{Hence price per gallon} = \frac{\pounds 21\ 12s.}{30} = 14s.\ 4\tfrac{4}{5}d.$$

18. Gain to be made on 50 bullocks

$$= \pounds 120 + \pounds 12\ 10s. + \pounds 62\ 10s. = \pounds 195;$$

$$\therefore \text{ gain on each} = \frac{195}{50}\,\pounds. = \pounds 3\ 18s.$$

19. 2 lbs. of the mixture cost 3*s.* 8*d.* + 4*s.* 4*d.* or 8*s.*;

$$\therefore \text{ 1 lb. will cost } 4s.;$$

$$\therefore \pounds 100 : \pounds 115 :: 4s. : \text{selling price},$$

$$\text{or selling price} = \frac{115 \times 4}{100}\,s. = 4s.\ 7\tfrac{1}{5}d.$$

20.

$$\pounds 100 : \pounds 120 :: \pounds 30 : \text{selling price};$$

$$\therefore \text{ selling price} = \frac{120 \times 30}{100}\,\pounds. = \pounds 36.$$

Again, £100 : £90 :: £10 : price ⅓ of the goods sold for;

$$\therefore \text{ price fetched by } \tfrac{1}{3} \text{ of the goods} = \frac{90 \times 10}{100}\,\pounds. = \pounds 9;$$

$$\therefore \text{ he must sell the remainder for } \pounds 36 - \pounds 9 \text{ or } \pounds 27.$$

21.

$$\pounds 100 : \pounds 130 :: \pounds 525 : \text{price the house sold for};$$

$$\therefore \text{ price of house} = \frac{525 \times 130}{100}\,\pounds. = \pounds 682\ 10s.,$$

$$\text{and expenses of sale} = \frac{1}{20} \text{ of } \pounds 682\ 10s. = \pounds 34\ 2s.\ 6d.;$$

$$\therefore \text{ sum to be received} = \pounds 682\ 10s. - \pounds 34\ 2s.\ 6d. = \pounds 648\ 7s.\ 6d.$$

22.

$$\text{Number of gallons sold} = 76 - 13 + 9 = 72;$$

$$\therefore \text{ selling price} = 7s.\ 6d. \times 72 = \pounds 27;$$

$$\therefore \text{ gain} = \pounds 27 - \pounds 23\ 12s.\ 6d. = \pounds 3\ 7s.\ 6.$$

$$\text{Hence} \quad \pounds 23\tfrac{5}{8} : \pounds 3\tfrac{3}{8} :: \pounds 100 : \text{gain per cent.};$$

$$\therefore \text{ gain per cent.} = \frac{100 \times 27 \times 8}{8 \times 189}\,\pounds. = \frac{100}{7}\,\pounds. = \pounds 14\ 5s.\ 8\tfrac{1}{2}d.\ \tfrac{2}{7}q.$$

23.

$$\text{Profit on 1000 quills} = \tfrac{3}{8} \text{ of } 11s. + 2s.\ 6d.$$

$$= 4s.\ 1\tfrac{1}{2}d. + 2s.\ 6d. = 6s.\ 7\tfrac{1}{2}d;$$

$$\therefore \text{ cost of 1000 quills} = 13s.\ 6d. - 6s.\ 7\tfrac{1}{2}d. = 6s.\ 10\tfrac{1}{2}d.$$

$$\text{Hence} \quad 6s.\ 10\tfrac{1}{2}d. : 6s.\ 7\tfrac{1}{2}d. :: \pounds 100 : \text{gain per cent.};$$

$$\therefore \text{ gain per cent.} = \frac{318 \times 100}{330}\,\pounds. = \pounds 96\ 7s.\ 3\tfrac{3}{11}d.$$

24. £8 14*s*. = cost price of (72 + 11·52) yds. or 83·52 yds.;

$$\therefore \text{ cost of each yard} = \frac{174}{83{\cdot}52}\,s.;$$

$$\therefore \text{ whole profit} = \frac{11{\cdot}52 \times 174}{83{\cdot}52}\,s. = £1\ 4s.;$$

$$\therefore \text{ cost price} = £8\ 14s. - £1\ 4s. = £7\ 10s.$$

Hence £7 10*s*. : £1 4*s*. :: £100 : gain per cent.;

$$\therefore \text{ gain per cent.} = \frac{100 \times 24}{150}\,£. = £16.$$

25. Cost of tobacco = (15 × 6 × 112) *d*. = £42.

Hence, (1) 4 cwt. : 1 lb. :: £42 : price in first case;

$$\therefore \text{ price for neither gain or loss} = \frac{42}{448}\,£. = 1s.\ 10\tfrac{1}{2}d.$$

(2) 4 cwt. : 1 lb. :: £47¼ : price in second case;

$$\therefore \text{ price to gain 5 guineas} = \frac{189}{448 \times 4}\,£. = 2s.\ 1\tfrac{1}{4}d.\ \tfrac{1}{4}q.$$

(3) 4 cwt. : 1 lb. :: £84 : price in third case;

$$\therefore \text{ price to gain cent. per cent.} = \frac{84}{448}\,£. = 3s.\ 9d.$$

26. £84½ : £15½ :: £3000 : gain;

$$\therefore \text{ gain} = \frac{3000 \times 31 \times 2}{169 \times 2}\,£. = £550\ 5s.\ 11\tfrac{1}{169}d.,$$

$$\text{and gain per cent.} = \frac{1}{30} \text{ of the whole gain} = £18\ 6s.\ 10\tfrac{62}{169}d.$$

27.
$$\text{Selling price per pipe} = \frac{1}{14\frac{1}{2}} \text{ of } £1120\tfrac{14}{25} = \frac{1932}{25}\,£.;$$

$$\therefore £80 : £100 :: \frac{1932}{25}\,£. : \text{cost price per pipe};$$

$$\therefore \text{ cost price per pipe} = \frac{100 \times 1932}{25 \times 80}\,£. = £96.\ 12s.$$

$$\text{Also selling price per gallon} = \frac{1}{126} \text{ of } \frac{1932}{25}\,£. = 12s.\ 3\tfrac{1}{5}d.$$

28. Rent on 1st supposition = £96 + (no. of qrs. × 56) *s*.,

.... 2nd .... = £96 + (no. of qrs. × 38) *s*.

Hence £100 : £85 :: £96 + (no. of qrs. × 56) *s*. : £96 + (no. of qrs. × 38) *s*.;

$$\therefore\ \pounds 96 + (\text{no. of qrs.} \times 38)\,s. = \frac{\{\pounds 96 + (\text{no. of qrs.} \times 56)\,s.\} \times 85}{100};$$

$$\therefore\ \pounds 96 + (\text{no. of qrs.} \times 38)\,s. = \frac{17}{20} \text{ of } \pounds 96 + \frac{17}{20} \text{ of } (\text{no. of qrs.} \times 56)\,s.;$$

$$\therefore\ \frac{3}{20} \text{ of } \pounds 96 = \left(\frac{17}{20} \times 56 - 38\right) s. \times \text{no. of qrs.};$$

$$\therefore\ \pounds 288 = (952 - 760)\,s. \times \text{no. of qrs.},$$

$$\text{or } (288 \times 20)\,s. = 192\,s. \times \text{no. of qrs.};$$

$$\therefore\ \text{no. of qrs.} = \frac{288 \times 20}{192} = 30.$$

29. $$\pounds 100 : \pounds 104 :: \pounds 150 : \text{price to gain 4 per cent.};$$

$$\therefore\ \text{selling price} = \frac{104 \times 150}{100}\,\pounds. = \pounds 156.$$

$$\text{And } \pounds 100 : \pounds 96 :: \pounds 50 : \text{price } \tfrac{1}{3} \text{ of goods were sold at};$$

$$\therefore\ \text{price of } \tfrac{1}{3} \text{ of goods} = \frac{96 \times 50}{100}\,\pounds. = \pounds 48.$$

He must now sell the rest for £108, and the excess of this sum over £96 (at which price he would have sold the goods at the first rate) being £12, we have

$$\pounds 96 : \pounds 12 :: 100 : \text{rate of increase per cent.};$$

$$\therefore\ \text{rate per cent.} = \frac{100 \times 12}{96} = 12\tfrac{1}{2}.$$

30. By the sale the person receives $\frac{95}{100}$ of cost of watch.

If he had received £3 more he would have had $\frac{101}{100}$ of cost of watch;

$$\therefore\ \frac{101}{100} \text{ cost of watch} = \frac{95}{100} \text{ cost of watch} + \pounds 3,$$

$$\text{or } \frac{6}{100} \text{ cost of watch} = \pounds 3;\ \therefore \text{ watch costs } \pounds 50.$$

Again, since the duty was 25 per cent.,

$$125 : 100 :: \pounds 50 : \text{price received by French maker};$$

$$\therefore\ \text{maker receives } \frac{100 \times 50}{125}\,\pounds. \text{ or } \pounds 40.$$

Ex. LXIV. (p. 252).

1. $1500 + 7000 + 9500 = 18000$;

$\therefore$ 18000 : 1500 :: 72 : number from 1st town,

18000 : 7000 :: 72 : number from 2nd town,

18000 : 9500 :: 72 : number from 3rd town;

$$\therefore \text{ number from 1st town} = \frac{1500 \times 72}{18000} = 6,$$

$$\text{number from 2nd town} = \frac{7000 \times 72}{18000} = 28,$$

$$\text{number from 3rd town} = \frac{9500 \times 72}{18000} = 38.$$

2. $16 + 5 = 21$;

$\therefore$ 21 : 16 :: £17 11*s*. 9*d*. : larger part;

$$\therefore \text{ larger part} = \frac{16 \times 4221}{21}\, d. = £13\ 8s.$$

And 21 : 5 :: £17 11*s*. 9*d*. : smaller part;

$$\therefore \text{ smaller part} = \frac{5 \times 4221}{21}\, d. = £4\ 3s.\ 9d.$$

3. $3 + 5 + 7 + 11 = 26$;

$\therefore$ 26 : 3 :: 4472 : 1st part; $\therefore$ 1st part = 516,

26 : 5 :: 4472 : 2nd part; $\therefore$ 2nd part = 860,

26 : 7 :: 4472 ; 3rd part; $\therefore$ 3rd part = 1204,

26 : 11 :: 4472 : 4th part; $\therefore$ 4th part = 1892.

Again, $$\frac{1}{2} + \frac{3}{5} + \frac{5}{7} = \frac{117}{70};$$

$\therefore \frac{117}{70} : \frac{1}{2}$ :: £500 : 1st part; $\therefore$ 1st part = £149 11*s*. $5\frac{17}{39}$*d*.,

$\frac{117}{70} : \frac{3}{5}$ :: £500 : 2nd part; $\therefore$ 2nd part = £179 9*s*. $8\frac{12}{13}$*d*.,

$\frac{117}{70} : \frac{4}{7}$ :: £500 : 3rd part; $\therefore$ 3rd part = £170 18*s*. $9\frac{25}{39}$*d*.

4. Sum of the debts = £601 10*s*.;

	£.		£.		£.			£.	s.	d.
$\therefore$	$601\frac{1}{2}$	:	$256\frac{1}{3}$	::	$421\frac{1}{20}$	: *A*'s dividend;	$\therefore$ *A* has	179	8	8
	$601\frac{1}{2}$	:	$203\frac{1}{2}$	::	$421\frac{1}{20}$	: *B*'s dividend;	$\therefore$ *B* has	142	9	0
	$601\frac{1}{2}$	:	$141\frac{2}{3}$	::	$421\frac{1}{20}$	: *C*'s dividend;	$\therefore$ *C* has	99	3	4

5. Sum of parts $= 3 + 4 + 15 = 22$;

$$\therefore\ 22 : 15 :: \overset{\text{cwt.}}{18} : \text{weight of gold}; \qquad \therefore\ \text{weight of gold} = \overset{\text{cwt.}}{12} \,.\, \overset{\text{lbs.}}{30\tfrac{6}{11}},$$
$$22 : 4 :: 18 : \text{weight of silver}; \qquad \therefore\ \text{weight of silver} = 3 \,.\, 30\tfrac{6}{11},$$
$$22 : 3 :: 18 : \text{weight of copper}; \qquad \therefore\ \text{weight of copper} = 2 \,.\, 50\tfrac{10}{11}.$$

6. Amount of capital $= £2200 + £1800 = £4000$;

$$\therefore\ \overset{£.}{4000} : \overset{£.}{2200} :: \overset{£.}{720} : \text{larger share}; \qquad \therefore\ \text{larger share} = \overset{£.}{396},$$
$$4000 : 1800 :: 720 : \text{smaller share}; \qquad \therefore\ \text{smaller share} = 324.$$

7. Sum of the parts $= 100$;

$$\therefore\ 100 : 49{\cdot}856 :: \overset{\text{lbs.}}{112} : \text{wt. of oxygen}; \qquad \therefore\ \text{wt. of oxygen} = \overset{\text{lbs.}}{1116{\cdot}7744},$$
$$100 : 43{\cdot}265 :: 112 : \text{wt. of carbon}; \qquad \therefore\ \text{wt. of carbon} = 969{\cdot}136,$$
$$100 : 6{\cdot}879 :: 112 : \text{wt. of hydrogen}; \qquad \therefore\ \text{wt. of hydrogen} = 154{\cdot}0896.$$

8. Number of shares $= 3 + 6 + 3 = 12$;

$$\therefore\ 12 : 3 :: \overset{£.}{13000} : \text{eldest son's share}; \quad \therefore\ \text{eldest son's share} = \overset{£.}{3250} \,.\, \overset{s.}{0} \,.\, \overset{d.}{0}$$
$$12 : 2 :: 13000 : \text{a younger son's share};$$
$$\therefore\ \text{a younger son's share} = 2166 \,.\, 13 \,.\, 4$$
$$12 : 1 :: 13000 : \text{a daughter's share};$$
$$\therefore\ \text{a daughter's share} = 1083 \,.\, 6 \,.\, 8$$

9. Capital $= 3200$. Sum to be divided $= £800 - £80 = £720$;

$$\therefore\ \overset{£.}{3200} : \overset{£.}{2000} :: \overset{£.}{720} : B\text{'s share}; \qquad \therefore\ B\text{'s share} = \overset{£.}{450}$$
$$3200 : 1200 :: 720 : A\text{'s share}; \qquad \therefore\ A\text{'s share} = 270;$$
$$\therefore\ A \text{ receives in all } £270 + £80 = £350.$$

10. If A and B have each 1 share; C will have 2 such shares, and D 4 such shares;

$$\therefore\ 8 : 1 :: \overset{£.}{100} : A\text{'s or } B\text{'s share}; \qquad \therefore\ A \text{ and } B \text{ have } \overset{£.}{12} \,.\, \overset{s.}{10}$$
$$8 : 2 :: 100 : C\text{'s share}; \qquad \therefore\ C \text{ has } 25 \,.\, 0$$
$$8 : 4 :: 100 : D\text{'s share}; \qquad \therefore\ D \text{ has } 50 \,.\, 0$$

11. A's share $= \frac{4}{3}$ B's share, and C's share $= \frac{5}{6}$ B's share;

$$\therefore\ A\text{'s share} + B\text{'s share} + C\text{'s share} = \left(\tfrac{4}{3} + 1 + \tfrac{5}{6}\right) B\text{'s share};$$
$$\therefore\ £11875 = \frac{19}{6}\, B\text{'s share};$$

$$\therefore\ B\text{'s share} = \frac{6}{19} \text{ of } \overset{\pounds.}{11875} = \overset{\pounds.}{3750},$$

$$A\text{'s share} = \tfrac{4}{3} \text{ of } 3750 = 5000,$$

$$C\text{'s share} = \tfrac{5}{6} \text{ of } 3750 = 3125.$$

12. $\pounds(1000 \times 5 + 15000 \times 3) : \pounds(15000 \times 3) :: \pounds1500 : B\text{'s share};$

$$\therefore\ B\text{'s share} = \frac{15000 \times 3 \times 1500}{50000}\,\pounds. = \pounds1350.$$

13. $\text{Equated time} = \dfrac{700 \times 3 + 800 \times 5 + 500 \times 10}{700 + 800 + 500}\text{ mo.} = 5\tfrac{11}{20}\text{ mo.}$

14. $\text{Equated time} = \dfrac{375 \times 4 + 281\tfrac{1}{4} \times 5 + 93\tfrac{3}{4} \times 6}{750}\text{ mo.}$

$$= \frac{13875}{4 \times 750}\text{ mo.} = \frac{37}{8}\text{ mo.} = 4\tfrac{5}{8}\text{ mo.}$$

15. $\text{Remainder of debt} = \dfrac{13}{60};$

$$\therefore\ \frac{13}{60} \times \text{no. of months required} = 7\tfrac{1}{30} - \frac{1}{3} \times 4 - \frac{1}{4} \times 6 - \frac{1}{5} \times 8 = \frac{13}{5};$$

$$\therefore\ \text{no. of months required} = \frac{13}{5} \times \frac{60}{13} = 12.$$

16. $70 \times 6 + 40 \times 9 + 50 \times 7 : 50 \times 7 :: \pounds11\tfrac{3}{10} : C\text{'s share};$

$$\therefore\ C\text{'s share} = \frac{350 \times 113}{1130 \times 10}\,\pounds. = \pounds3\ 10s.$$

17. Profits to be shared by B and $C = \tfrac{3}{4}$ of $\pounds450 = \pounds337\tfrac{1}{2}$;

$$\therefore\ \pounds500 + \pounds300 : \pounds300 :: \pounds337\tfrac{1}{2} : C\text{'s share};$$

$$\therefore\ C\text{'s share} = \frac{300 \times 675}{2 \times 800}\,\pounds. = \pounds126\ 11s.\ 3d.$$

18. $(25 \times 4 + 25 \times 12) + (15 \times 6 + 30 \times 12) + (70 \times 6) = 1270;$

$$\therefore\ 1270 : 400 :: \overset{\pounds.}{254} : A\text{'s share}; \quad \therefore\ A\text{'s share} = \overset{\pounds.}{80},$$

$$1270 : 450 :: 254 : B\text{'s share}; \quad \therefore\ B\text{'s share} = 90,$$

$$1270 : 420 :: 254 : C\text{'s share}; \quad \therefore\ C\text{'s share} = 84.$$

Ex. LXV. (p. 255).

1. $\pounds 1 : \pounds 1519\frac{7}{8} :: 23{\cdot}45 \text{ fr.} : \text{francs required};$

$$\therefore \text{ francs required} = \frac{12159 \times 23{\cdot}45}{8} \text{ fr.} = \pounds 35641 \ 6\tfrac{7}{8} \text{ c.}$$

2. $1 \text{ mil.} : 4750{\cdot}280 \text{ mil.} :: 64\frac{1}{4}d. : \text{sum required};$

$$\therefore \text{ sum required} = \frac{4750{\cdot}28 \times 257}{4}\, d. = \pounds 1271 \ 13s. \ 9\tfrac{49}{100}d.$$

3. $47\frac{1}{2}d. : \pounds 246 \ 15s. \ 6d. :: 1 \text{ pias.} : \text{number of piastres required};$

$$\therefore \text{ number of piast.} = \frac{118452 \times 2}{95} = 1246 \text{ pias. } 6\tfrac{86}{95} \text{ rials.}$$

4. $1 \text{ mil.} : 2000 \text{ mil.} :: 68\,d. : \text{value required};$

$$\therefore \text{ value required} = (2000 \times 68)\, d. = \pounds 566 \ 13s. \ 4d.$$

5. $106\frac{1}{2} : 100 :: 35\frac{1}{2}s. : \text{par of exchange};$

$$\therefore \text{ par of exchange} = \frac{100 \times 71 \times 2}{113 \times 2}\, d. = 33s. \ 4d.$$

6. $1 \text{ franc} = \frac{240}{25{\cdot}6}\, d. \qquad 1 \text{ ree} = \frac{1}{172} \text{ francs} = \frac{240}{172 \times 25{\cdot}6}\, d.;$

$$\therefore \ 1 \text{ milree} = \frac{1000 \times 240}{172 \times 25{\cdot}6}\, d. = \frac{9375}{172}\, d. = 54\tfrac{87}{172}d.$$

7. $36s. \ 3d. : 91d. :: \pounds 1 : \text{value of ruble viâ Amsterdam};$

$$\therefore \text{ value of ruble} = \frac{91 \times 240}{435}\, d. = 50\tfrac{6}{29}d.$$

And in the direct way the ruble costs 50*d.*;

∴ the direct way is the cheaper.

8. $25{\cdot}6 \text{ fr.} : 500 \text{ fr.} :: \pounds 1 : \text{value required};$

$$\therefore \text{ value required} = \frac{500}{22{\cdot}6}\, \pounds. = \pounds 19 \ 10s. \ 7\tfrac{1}{2}d.$$

Again, $1 \text{ ree} = \frac{1}{160} \text{ francs}; \ \therefore \ 400 \text{ rees} = \frac{5}{2} \text{ francs};$

$$\therefore \ 3\tfrac{1}{2}s. \text{ Flemish} = \frac{5}{2} \text{ francs}; \quad \therefore \ 1s. \text{ Flemish} = \frac{5}{7} \text{ francs};$$

$$\therefore \ \pounds 1 = 35s. \text{ Flemish} = \frac{35 \times 5}{7} \text{ francs} = 25 \text{ francs.}$$

9. On 1st supposition 1 franc $= \frac{1}{23}$ £.; $\therefore$ 1 ruble $= \frac{2}{23}$ £.

On 2nd supposition 1 franc $= \frac{1}{24}$ £.; $\therefore$ 1 ruble $= \frac{1}{16}$ £.;

$\therefore$ broker gains $\left(\frac{2}{23} - \frac{1}{16}\right)$ £. on each ruble;

$\therefore$ he gains in all $\frac{460 \times 9}{16 \times 23}$ £., or £11 5*s*.

10. Remitting to Cadiz directly, 1 pistole = £$\frac{3}{4}$.

Again, remitting through France,

1 pistole = 19 francs $= \frac{19}{25{\cdot}4}$ £. $= \frac{190}{254}$ £.,

and comparing the fractions $\frac{3}{4}$ and $\frac{190}{254}$ the former is found to be the greater; therefore it is better to transmit through France.

Ex. LXVI. (p. 263.)

1. (1)

$$\begin{array}{r|l} & \dot{2}8\dot{9}\,(17 \\ & 1 \\ \hline 27 & 189 \\ & 189 \\ \hline \end{array} \qquad \begin{array}{r|l} & \dot{5}7\dot{6}\,(24 \\ & 4 \\ \hline 44 & 176 \\ & 176 \\ \hline \end{array} \qquad \begin{array}{r|l} & \dot{1}4\dot{4}4\,(38 \\ & 9 \\ \hline 68 & 544 \\ & 544 \\ \hline \end{array} \qquad \begin{array}{r|l} & \dot{4}0\dot{9}6\,(64 \\ & 36 \\ \hline 124 & 496 \\ & 496 \\ \hline \end{array}$$

(2)

$$\begin{array}{r|l} & 6\dot{5}6\dot{1}\,(81 \\ & 64 \\ \hline 161 & 161 \\ & 161 \\ \hline \end{array} \qquad \begin{array}{r|r} & \dot{2}1\dot{0}2\dot{5}\,(145 \\ & 1 \\ \hline 24 & 110 \\ & 96 \\ \hline 285 & 1425 \\ & 1425 \\ \hline \end{array} \qquad \begin{array}{r|r} & 1\dot{7}3\dot{0}5\dot{6}\,(416 \\ & 16 \\ \hline 81 & 130 \\ & 81 \\ \hline 826 & 4956 \\ & 4956 \\ \hline \end{array}$$

(3)

$$\begin{array}{r|r} & \dot{9}8\dot{5}9\dot{6}\,(314 \\ & 9 \\ \hline 61 & 85 \\ & 61 \\ \hline 624 & 2496 \\ & 2496 \\ \hline \end{array} \qquad \begin{array}{r|r} & \dot{3}7\dot{2}4\dot{9}\,(193 \\ & 1 \\ \hline 29 & 272 \\ & 261 \\ \hline 383 & 1149 \\ & 1149 \\ \hline \end{array} \qquad \begin{array}{r|l} & \dot{1}1\dot{6}6\dot{4}\,(108 \\ & 1 \\ \hline 208 & 1664 \\ & 1664 \\ \hline \end{array}$$

(4)

$$\begin{array}{r|r} & 9\dot{9}8\dot{0}0\dot{1}\,(999 \\ & 81 \\ \hline 189 & 1880 \\ & 1701 \\ \hline 1989 & 17901 \\ & 17901 \\ \hline \end{array} \qquad \begin{array}{r|r} & 9\dot{7}8\dot{1}2\dot{1}\,(989 \\ & 81 \\ \hline 188 & 1681 \\ & 1504 \\ \hline 1969 & 17721 \\ & 17721 \\ \hline \end{array} \qquad \begin{array}{r|l} & 8\dot{2}4\dot{4}6\dot{4}\,(908 \\ & 81 \\ \hline 1808 & 14464 \\ & 14464 \\ \hline \end{array}$$

(5)	$2\dot{9}5\dot{0}6\dot{6}2\dot{4}$ (5432
	25
104	450
	416
1083	3466
	3249
10862	21724
	21724

	$1\dot{4}3\dot{5}6\dot{5}2\dot{1}$ (3789
	9
67	535
	469
748	6665
	5984
7569	68121
	68121

	$\dot{5}3\dot{4}5\dot{3}4\dot{4}$ (2312
	4
43	134
	129
461	553
	461
4622	9244
	9244

(6)	$\dot{2}3\dot{6}1\dot{4}4\dot{6}8\dot{9}$ (15367
	1
25	136
	125
303	1114
	909
3066	20546
	18396
30727	215089
	215089

	$2\dot{8}2\dot{4}2\dot{9}5\dot{3}6\dot{4}8\dot{1}$ (531441
	25
103	324
	309
1061	1529
	1061
10624	46853
	42496
106284	435764
	425136
1062881	1062881
	1062881

	$\dot{2}8\dot{2}4\dot{7}5\dot{2}4\dot{9}$ (16807
	1
26	182
	156
328	2647
	2624
33607	235249
	235249

(7)	$2\dot{9}5\dot{0}6\dot{6}2\dot{4}0\dot{0}0\dot{0}$ (543200
	25
104	450
	416
1083	3466
	3249
10862	21724
	21724
	0000

	$\dot{4}1\dot{6}0\dot{5}8\dot{0}0\dot{6}2\dot{5}0\dot{0}$ (2039750
	4
403	1605
	1209
4069	39680
	36621
40787	305906
	285509
407945	2039725
	2039725
	00

2. (1)	$\dot{1}6\dot{7}\cdot 9\dot{6}1\dot{6}$ (12·96
	1
22	67
	44
249	2396
	2241
2586	15516
	15516

	$2\dot{8}\cdot 8\dot{3}6\dot{9}$ (5·37
	25
103	383
	309
1067	7469
	7469

$5\dot{7}64\dot{8}\cdot0\dot{1}$ (240·1

	4
44	176
	176
4801	4801
	4801

(2) $\cdot3\dot{4}8\dot{6}7\dot{8}4\dot{4}0\dot{1}$ (·59049

	25
109	986
	981
11804	57844
	47216
118089	1062801
	1062801

$3\dot{9}\cdot1\dot{5}3\dot{8}0\dot{3}2\dot{9}$ (6·2573

	36
122	315
	244
1245	7138
	6225
12507	91303
	87549
125143	375429
	375429

(3) $\cdot0\dot{4}2\dot{8}4\dot{9}$ (·207

	4
407	2849
	2849

$\cdot0\dot{0}1\dot{3}9\dot{8}7\dot{6}$ (·0374

	9
67	498
	469
744	2976
	2976

$\cdot0\dot{0}2\dot{0}3\dot{4}0\dot{1}$ (·0451

	16
85	434
	425
901	901
	901

(4) $\dot{5}7\dot{7}4\dot{4}0\dot{9}$ (2403

	4
44	177
	176
4803	14409
	14409

$\dot{5}\cdot7\dot{7}4\dot{4}0\dot{9}$ (2·403

	4
44	177
	176
4803	14409
	14409

(5) $1\dot{2}0\dot{8}8\dot{8}\cdot6\dot{8}3\dot{7}9\dot{0}2\dot{5}$ (347·6905

	9
64	308
	256
6 8	5288
	4809
6946	47968
	41676
69529	629237
	625761
6953805	34769025
	34769025

$2\dot{4}0\dot{3}9\dot{8}\cdot0\dot{1}2\dot{4}1\dot{6}$ (490·304

	16
89	803
	801
9803	29801
	29409
98064	3922416
	3922416

3. (1) $1\dot{6}$ (4
16

$\dot{1}\cdot6\dot{0}0\dot{0}0\dot{0}$ (1·2649...

	1
22	60
	44
246	1600
	1476
2524	12400
	10096
25289	230400
	227601
	2799

```
·16̇ (·4
 16
 ──
```

```
          ·01̇60̇00̇00̇ (·1264...
            1
           ───
   22   │   60
        │   44
        │  ────
  246   │  1600
        │  1476
        │  ─────
 2524   │  12400
        │  10096
        │  ──────
             2344
```

```
(2)          2̇35̇·60̇00̇00̇00̇ (15·3492...
             1
            ───
     25   │ 135
          │ 125
          │ ────
    303   │ 1060
          │  909
          │ ─────
   3064   │ 15100
          │ 12256
          │ ──────
  30689   │ 284400
          │ 276001
          │ ───────
 306982   │  839900
          │  613964
          │ ────────
             225936
```

```
          ·10̇00̇00̇00̇ (·3162...
            9
           ───
   61   │  100
        │   61
        │  ────
  626   │  3900
        │  3756
        │  ─────
 6322   │  14400
        │  12644
        │  ──────
            1756
```

```
·01̇ (·1
  1
 ──
```

```
           ·50̇00̇00̇00̇ (·7071...
            49
           ─────
  1407   │ 10000
         │  9849
         │ ──────
 14141   │  15100
         │  14141
         │ ──────
              959
```

```
            5̇·00̇00̇00̇00̇ (2·2360...
            4
           ────
   42   │  100
        │   84
        │  ─────
  443   │  1600
        │  1329
        │  ──────
 4466   │  27100
        │  26796
        │  ──────
 4472   │   31400
```

```
(3)        ·00̇04̇ (·02
              4
             ──
```

```
          ·00̇08̇10̇00̇ (·0284...
             4
           ────
   48   │  410
        │  384
        │  ─────
  564   │  2600
        │  2256
        │  ─────
            344
```

```
              379·86400000 (19·4901...
              1
             ───
     29   │  279
          │  261
          │  ────
    384   │  1886
          │  1536
          │  ─────
   3889   │  35040
          │  35001
          │  ───────
 389801   │   390000
          │   389801
          │  ───────
               199
```

(4)
$$\sqrt{20\tfrac{1}{4}} = \sqrt{\frac{81}{4}} = \frac{9}{2} = 4\tfrac{1}{2}.$$

$$\sqrt{153\tfrac{7}{9}} = \sqrt{\frac{1384}{9}} = \frac{37{\cdot}2021\ldots}{3} = 12{\cdot}4007\ldots$$

$$\sqrt{\tfrac{1}{3}} = \sqrt{{\cdot}33\dot{3}\ldots} = {\cdot}5778\ldots$$

$$\begin{array}{r|l} & 2\dot{2}0\dot{9}\,(47 \\ & 16 \\ \hline 87 & 609 \\ & 609 \\ \hline \end{array} \qquad \begin{array}{r|l} & \dot{9}8\dot{0}\dot{1}\,(99 \\ & 81 \\ \hline 189 & 1701 \\ & 1701 \\ \hline \end{array}$$

$$\therefore \sqrt{\frac{2209}{9801}} = \frac{47}{99}.$$

(5) $$\sqrt{\frac{3}{5}} = \sqrt{\left(\frac{3 \times 5}{5 \times 5}\right)} = \frac{\sqrt{15}}{5} = \frac{3\cdot8729\ldots}{5} = \cdot7745\ldots$$

$$\sqrt{\frac{1}{17}} = \sqrt{\left(\frac{1 \times 17}{17 \times 17}\right)} = \frac{\sqrt{17}}{17} = \frac{4\cdot12310\ldots}{17} = \cdot2425\ldots$$

$$\sqrt{2\tfrac{1}{6}} = \sqrt{2\cdot166\dot{6}\ldots} = 1\cdot4719\ldots$$

$$\sqrt{\frac{3\frac{1}{2}}{4\frac{1}{2}}} = \sqrt{\frac{7}{9}} = \frac{\sqrt{7}}{3} = \frac{2\cdot6457\ldots}{3} = \cdot8819\ldots$$

(6) $$\sqrt{\frac{5\cdot04}{\cdot021}} = \sqrt{\frac{5040}{21}} = \sqrt{240} = 15\cdot4919\ldots$$

$$\sqrt{1\tfrac{56}{169}} = \sqrt{\frac{225}{169}} = \frac{25}{13} = 1\tfrac{2}{13}.$$

$$\begin{array}{r|l} & 23\cdot\dot{1}0\dot{0}0\dot{0}0\dot{0}0\,(4\cdot8062\ldots \\ & 16 \\ \hline 88 & 710 \\ & 704 \\ \hline 9606 & \quad 60000 \\ & \quad 57636 \\ \hline 96122 & \quad 236400 \\ & \quad 192244 \\ \hline & \qquad 44156 \end{array} \qquad \begin{array}{r|l} & 4\dot{2}\cdot0\dot{0}0\dot{0}0\dot{0}0\dot{0}\,(6\cdot4807\ldots \\ & 36 \\ \hline 124 & 600 \\ & 496 \\ \hline 1288 & 10400 \\ & 10304 \\ \hline 129607 & \quad 960000 \\ & \quad 907249 \\ \hline & \qquad 52751 \end{array}$$

4.

$$\begin{array}{r|l} & \cdot0\dot{0}1\dot{9}1\dot{4}0\dot{6}2\dot{5}\,(\cdot04375 \\ & 16 \\ \hline 85 & 314 \\ & 249 \\ \hline 867 & \quad 6506 \\ & \quad 6069 \\ \hline 8745 & \quad 43725 \\ & \quad 43725 \\ \hline \end{array}$$

and $$\cdot04375 = \frac{4375}{100000} = \frac{875}{20000} = \frac{175}{4000} = \frac{35}{800} = \frac{7}{160}.$$

5. Area of rectangular field

= (700 × 2800) sq. yds. = 1960000 sq. yds.;

$\therefore$ side of square field = $\sqrt{1960000}$ = 1400 yds.

6.

ac. ro. po. sq. yds.
1 . 0 . 22 . $7\frac{9}{16}$.
4
4 ro.
40
182 po.
$30\frac{1}{4}$
5460
$45\frac{1}{2}$
$7\frac{9}{16}$
$5513\frac{1}{16}$ sq. yds.

$$\therefore \text{ side of field} = \sqrt{5513\tfrac{1}{16}} = \sqrt{\frac{88209}{16}} = \frac{297}{4} = 74\tfrac{1}{4} \text{ yards.}$$

7.

$$(\text{Diagonal})^2 = (\text{length})^2 + (\text{breadth})^2 = (225)^2 + (120)^2 = 50625 + 14400 = 65025;$$

$$\therefore \text{ diagonal} = \sqrt{65025} = 255 \text{ yards.}$$

8. 8*d.* : £27 1*s.* 6*d.* :: 1 sq. yard : no. of sq. yards in enclosure;

$$\therefore \text{ area} = \frac{6498}{4} \text{ sq. yds.} = \frac{3249}{4} \text{ sq. yds.};$$

$$\therefore \text{ length of side} = \sqrt{\frac{3249}{4}} = \frac{57}{2} = 28\tfrac{1}{2} \text{ yds.}$$

9.

$$(\text{hypothenuse})^2 = (\text{perpendicular})^2 + (\text{base})^2,$$

$$\text{or } (51)^2 = (24)^2 + (\text{base})^2;$$

$$\therefore (\text{base})^2 = 2601 - 576 = 2025;$$

$$\therefore \text{ base} = \sqrt{2025} = 45 \text{ yards.}$$

10.

$$(\text{Length of ladder})^2 = (\text{width of path})^2 + (\text{height to which ladder reaches})^2,$$

$$\text{or } (91)^2 = (35)^2 + (\text{height})^2;$$

$$\therefore (\text{height})^2 = 8281 - 1225 = 7056;$$

$$\therefore \text{ height} = \sqrt{7056} = 84 \text{ ft.};$$

$$\therefore \text{ height of building} = 84 \text{ ft. } 9 \text{ in.}$$

11.

·0050722884(·07122
49
141 | 172
141
1422 | 3128
2844
14242 | 28484
28484

4840 sq. yds. = 1 acre
2
9680
9
87120
144
348480
348480
87120
12545280(3541 inches
9
65 | 354
325
704 | 2952
2816
7081 | 13680
7081
6599

12 | 3541 in.
3 | 295 – 1
yds. 98 1 ft. 1 in.

12. In 6 hours one travels 72 miles,

.... the other ...... 54 ....;

and, since they go in directions at right angles to each other,

$$(\text{distance required})^2 = (72)^2 + (54)^2 = 5184 + 2916 = 8100;$$

therefore, distance required $= \sqrt{(8100)} = 90$ miles.

13. $(\text{Length of one part of street})^2 = (36)^2 - (28)^2 = 1296 - 784 = 512;$

therefore, length of one part $= \sqrt{(512)} = 22\cdot62....$ ft.,

and $(\text{length of other part of street})^2 = (36)^2 - (26)^2 = 1296 - 676 = 620;$

therefore, length of other part $= \sqrt{(620)} = 24\cdot89....$ ft.;

therefore, length of street $= (22\cdot62.... + 24\cdot89....)$ ft. $= 47\cdot5....$ ft.

14. £45 18*s.* 9*d.* = 11025*d.*;

therefore, $(\text{number of members})^2 = 11025;$

therefore, number of members $= \sqrt{(11025)} = 105.$

15.

$$\begin{array}{r|r}
 & 2\dot{9}5\dot{0}6\dot{6}\cdot2\dot{4}\ (543\cdot2\text{ yds.} \\
 & 25 \\ \cline{2-2}
104 & 450 \\
 & 416 \\ \cline{2-2}
1083 & 3466 \\
 & 3249 \\ \cline{2-2}
10862 & 21724 \\
 & 21724 \\ \cline{2-2}
\end{array}$$

CUBE ROOT.

Ex. LXVII. (p. 271.)

1. (1)

$$\begin{array}{r|l}
 & \dot{1}72\dot{8}\ (12 \\
 & 1 \\ \cline{2-2}
3\times1^2=3 & 728 \\
3\times(10)^2=300 & \\
3\times10\times2=60 & \\
2^2=4 & \\ \cline{1-1}
364 & \\
2 & \\ \cline{1-1}
728 & 728 \\ \cline{2-2}
\end{array}
\qquad
\begin{array}{r|l}
 & \dot{3}37\dot{5}\ (15 \\
 & 1 \\ \cline{2-2}
3\times1^2=3 & 2375 \\
3\times(10)^2=300 & \\
3\times10\times5=150 & \\
5^2=25 & \\ \cline{1-1}
475 & \\
5 & \\ \cline{1-1}
2375 & 2375 \\ \cline{2-2}
\end{array}$$

$$\begin{array}{rr|l}
 & & 2\dot{9}79\dot{1}\ (31 \\
 & & 27 \\ \cline{3-3}
3\times3^2= & 27 & 2791 \\
3\times(30)^2= & 2700 & \\
3\times30\times1= & 90 & \\
1^2= & 1 & \\ \cline{2-2}
 & 2791 & 2791 \\ \cline{3-3}
\end{array}$$

(2)

$$\begin{array}{rr|l}
 & & 5\dot{4}87\dot{2}\ (38 \\
 & & 27 \\ \cline{3-3}
3\times3^2= & 27 & 27872 \\
3\times(30)^2= & 2700 & \\
3\times30\times8= & 720 & \\
8^2= & 64 & \\ \cline{2-2}
 & 3484 & \\
 & 8 & \\ \cline{2-2}
 & 27872 & 27872 \\ \cline{3-3}
\end{array}$$

$$\begin{array}{rr|l}
 & & 11\dot{0}59\dot{2}\ (48 \\
 & & 64 \\ \cline{3-3}
3\times4^2= & 48 & 46592 \\
3\times(40)^2= & 4800 & \\
3\times40\times8= & 960 & \\
8^2= & 64 & \\ \cline{2-2}
 & 5824 & \\
 & 8 & \\ \cline{2-2}
 & 46592 & 46592 \\ \cline{3-3}
\end{array}$$

$$\begin{array}{rr|l}
 & & 30\dot{0}76\dot{3}\ (67 \\
 & & 216 \\ \cline{3-3}
3\times6^2= & 108 & 84763 \\
3\times(60)^2= & 10800 & \\
3\times60\times7= & 1260 & \\
7^2= & 49 & \\ \cline{2-2}
 & 12109 & \\
 & 7 & \\ \cline{2-2}
 & 84763 & 84763 \\ \cline{3-3}
\end{array}$$

(3)

$$\begin{array}{rr|l}
 & & 68\dot{1}47\dot{2}\ (88 \\
 & & 512 \\ \cline{3-3}
3\times8^2= & 192 & 169472 \\
3\times(80)^2= & 19200 & \\
3\times80\times8= & 1920 & \\
8^2= & 64 & \\ \cline{2-2}
 & 21184 & \\
 & 8 & \\ \cline{2-2}
 & 169472 & 169472 \\ \cline{3-3}
\end{array}$$

$$\begin{array}{rr|l}
 & & 80\dot{4}35\dot{7}\ (93 \\
 & & 729 \\ \cline{3-3}
3\times9^2= & 243 & 75357 \\
3\times(90)^2= & 24300 & \\
3\times90\times3= & 810 & \\
3^2= & 9 & \\ \cline{2-2}
 & 25119 & \\
 & 3 & \\ \cline{2-2}
 & 75357 & 75357 \\ \cline{3-3}
\end{array}$$

$$\begin{array}{rr|l}
 & & 94\dot{1}19\dot{2}\ (98 \\
 & & 729 \\ \cline{3-3}
3\times9^2= & 243 & 212192 \\
3\times(90)^2= & 24300 & \\
3\times90\times8= & 2160 & \\
8^2= & 64 & \\ \cline{2-2}
 & 26524 & \\
 & 8 & \\ \cline{2-2}
 & 212192 & 212192 \\ \cline{3-3}
\end{array}$$

(4)

$\dot{2}40\dot{6}10\dot{4}\,(134$

1

$3\times1^2=3 \quad | \quad 1406$

$3\times(10)^2=300$

$3\times10\times3=\ \ 90$

$3^2=\ \ 9$

399

3

$1197 \quad | \quad 1197$

$3\times(13)^2=507 \quad | \quad 209104$

$3\times(130)^2=50700$

$3\times130\times4=\ \ 1560$

$4^2=\ \ 16$

52276

4

$209104 \quad | \quad 209104$

$6\dot{9}42\dot{6}53\dot{1}\,(411$

64

$3\times4^2=48 \quad | \quad 5426$

$3\times(40)^2=4800$

$3\times40\times1=\ \ 120$

$1^2=\ \ 1$

$4921 \quad | \quad 4921$

$3\times(41)^2=5043 \quad | \quad 505531$

$3\times(410)^2=504300$

$3\times410\times1=\ \ 1230$

$1^2=\ \ 1$

$505531 \quad | \quad 505531$

$\dot{8}36\dot{5}42\dot{7}\,(203$

8

$3\times2^2=\ \ 12 \quad | \quad 365427$

$3\times(20)^2=1200$

$3\times(200)^2=120000$

$3\times200\times3=\ \ 1800$

$3^2=\ \ 9$

121809

3

$365427 \quad | \quad 365427$

(5)

$25\dot{1}23\dot{9}59\dot{1}\,(631$

216

$3\times6^2=108 \quad | \quad 35239$

$3\times(60)^2=10800$

$3\times60\times3=\ \ 540$

$3^2=\ \ 9$

11349

3

$34047 \quad | \quad 34047$

$3\times(63)^2=11907 \quad | \quad 1192591$

$3\times(630)^2=1190700$

$3\times630\times1=\ \ 1890$

$1^2=\ \ 1$

$1192591 \quad | \quad 1192591$

$2\dot{8}37\dot{2}62\dot{5}\,(305$

27

$3\times3^2=\ \ 27 \quad | \quad 1372625$

$3\times(30)^2=2700$

$3\times(300)^2=270000$

$3\times300\times5=\ \ 4500$

$5^2=\ \ 25$

274525

5

$1372625 \quad | \quad 1372625$

$$\begin{array}{r|l}
 & 4\dot{8}22\dot{8}54\dot{4}\ (364 \\
 & 27 \\ \cline{2-2}
3\times(3)^2=27 & 21228 \\
3\times(30)^2=2700 & \\
3\times30\times6=\ \ 540 & \\
6^2=\ \ \ 36 & \\
\overline{3276} & \\
6 & \\
\overline{19656} & 19656 \\ \cline{2-2}
3\times(36)^2=3888 & 1572544 \\
3\times(360)^2=388800 & \\
3\times360\times4=\ \ \ 4320 & \\
4^2=\ \ \ \ 16 & \\
\overline{393136} & \\
4 & \\
\overline{1572544} & 1572544 \\ \cline{2-2}
\end{array}$$

(6)

$$\begin{array}{r|l}
 & 1\dot{7}17\dot{3}51\dot{2}\ (258 \\
 & 8 \\ \cline{2-2}
3\times2^2=12 & 9173 \\
3\times(20)^2=1200 & \\
3\times20\times5=\ \ 300 & \\
5^2=\ \ \ 25 & \\
\overline{1525} & \\
5 & \\
\overline{7625} & 7625 \\ \cline{2-2}
3\times(25)^2=1875 & 1548512 \\
3\times(250)^2=187500 & \\
3\times250\times8=\ \ \ 6000 & \\
8^2=\ \ \ \ 64 & \\
\overline{193564} & \\
8 & \\
\overline{1548512} & 1548512 \\ \cline{2-2}
\end{array}$$

$$\begin{array}{r|l}
 & 25\dot{9}69\dot{4}07\dot{2}\ (638 \\
 & 216 \\ \cline{2-2}
3\times6^2=108 & 43694 \\
3\times(60)^2=10800 & \\
3\times60\times3=\ \ \ 540 & \\
3^2=\ \ \ \ 9 & \\
\overline{11349} & \\
3 & \\
34047 & 34047 \\ \cline{2-2}
3\times(63)^2=11907 & 9647072 \\
3\times(630)^2=1190700 & \\
3\times630\times8=\ \ \ 15120 & \\
8^2=\ \ \ \ 64 & \\
\overline{1205884} & \\
8 & \\
\overline{9647072} & 9647072 \\ \cline{2-2}
\end{array}$$

$$\begin{array}{r|l}
 & 92\dot{6}85\dot{9}37\dot{5}\ (975 \\
 & 729 \\ \cline{2-2}
3\times9^2=243 & 197859 \\
3\times(90)^2=24300 & \\
3\times90\times7=\ \ 1890 & \\
7^2=\ \ \ \ 49 & \\
\overline{26239} & \\
7 & \\
\overline{183673} & 183673 \\ \cline{2-2}
3\times(97)^2=28227 & 14186375 \\
3\times(970)^2=2822700 & \\
3\times970\times5=\ \ \ 14550 & \\
5^2=\ \ \ \ 25 & \\
\overline{2837275} & \\
5 & \\
\overline{14186375} & 14186375 \\ \cline{2-2}
\end{array}$$

(7)

$2\dot{7}05\dot{4}03\dot{6}00\dot{8}\,(3002$

27

$3\times3^2=27$

$3\times(30)^2=2700$

$3\times(300)^2=270000$

$3\times(3000)^2=27000000$

$3\times3000\times2=18000$

$2^2=4$

27018004

2

54036008

54036008

54036008

$21\dot{9}36\dot{5}32\dot{7}79\dot{1}\,(6031$

216

$3\times6^2=108$

$3\times(60)^2=10800$

$3\times(600)^2=1080000$

$3\times600\times3=5400$

$3^2=9$

1085409

3

3256227

3365327

3256227

$3\times(603)^2=1090827$

$3\times(6030)^2=109082700$

$3\times6030\times1=18090$

$1^2=1$

109100791

109100791

109100791

2.

$\cdot38\dot{9}01\dot{7}\,(\cdot73$

343

$3\times7^2=147$

$3\times(70)^2=14700$

$3\times70\times3=630$

$3^2=9$

15339

3

46017

46017

46017

$\dot{3}2\cdot46\dot{1}75\dot{9}\,(3\cdot19$

27

$3\times(3)^2=27$

$3\times(30)^2=2700$

$3\times30\times1=90$

$1^2=1$

2791

5461

2791

$3\times(31)^2=2883$

$3\times(310)^2=288300$

$3\times310\times9=8370$

$9^2=81$

296751

9

2670759

2670759

2670759

$95443\cdot993\,(45\cdot7$

64

$3\times4^2=48$

$3\times(40)^2=4800$

$3\times40\times5=600$

$5^2=25$

5425

5

27125

31443

27125

$3\times(45)^2=6075$

$3\times(450)^2=607500$

$3\times450\times7=9450$

$7^2=49$

616999

7

4318993

4318993

4318993

$\cdot00\dot{1}90\dot{6}62\dot{4}\,(\cdot124$

1

$3\times1^2=3$

$3\times(10)^2=300$

$3\times10\times2=60$

$2^2=4$

364

2

728

906

728

$3\times(12)^2=432$

$3\times(120)^2=43200$

$3\times120\times4=1440$

$4^2=16$

44656

4

178624

178624

178624

	$\cdot 00\dot{0}91\dot{2}67\dot{3}\,(\cdot 097$
	729
$3\times 9^2=243$	183673
$3\times(90)^2=24300$	
$3\times 90\times 7=\ 1890$	
$7^2=\ 49$	
26239	
7	
183673	183673

	$\cdot 00\dot{0}02\dot{4}38\dot{9}\,(\cdot 029$
	8
$3\times 2^2=12$	16389
$3\times(20)^2=1200$	
$3\times 20\times 9=\ 540$	
$9^2=\ 81$	
1821	
9	
16389	16389

3. (1)

	$\dot{3}\cdot 00\dot{0}00\dot{0}00\dot{0}(1\cdot 442\ldots$
	1
$3\times 1^2=3$	2000
$3\times(10)^2=300$	
$3\times 10\times 4=120$	
$4^2=\ 16$	
436	
4	
1744	1744
$3\times(14)^2=588$	256000
$3\times(140)^2=58800$	
$3\times 140\times 4=\ 1680$	
$4^2=\ 16$	
60496	
4	
241984	241984
$3\times(144)^2=62208$	14016000
$3\times(1440)^2=6220800$	
$3\times 1440\times 2=\ 8640$	
$2^2=\ 4$	
6229444	
2	
12458888	12458888
	1557112

	$\cdot 30\dot{0}00\dot{0}00\dot{0}(\cdot 669\ldots$
	216
$3\times 6^2=108$	84000
$3\times(60)^2=10800$	
$3\times 60\times 6=\ 1080$	
$6^2=\ 36$	
11916	
6	
71496	71496
$3\times(66)^2=13068$	12504000
$3\times(660)^2=1306800$	
$3\times 660\times 9=\ 17820$	
$9^2=\ 81$	
1324701	
9	
11922309	11922309
	581691

	$\cdot 03\dot{0}00\dot{0}00\dot{0}\,(\cdot 310\ldots$
	27
$3\times 3^2=27$	3000
$3\times(30)^2=2700$	
$3\times 30\times 1=\ 90$	
$1^2=\ 1$	
2791	2791
$3\times(31)^2=2883$	209000

(2) $\sqrt[3]{\left(\frac{8}{27}\right)}=\frac{2}{3}$;

$\sqrt[3]{\left(\frac{250}{646}\right)}=\sqrt[3]{\left(\frac{125}{343}\right)}=\frac{5}{7}$;

$$\begin{array}{r|l}
 & 4\dot{4}\cdot60\dot{0}00\dot{0}00\dot{0}\,(3\cdot546\ldots \\
 & 27 \\
\hline
3\times3^2=27 & 17600 \\
3\times(30)^2=2700 & \\
3\times30\times5=\ \ 450 & \\
5^2=\ \ \ 25 & \\
\overline{3175} & \\
5 & \\
\overline{15875} & 15875 \\
\hline
3\times(35)^2=3675 & 1725000 \\
3\times(350)^2=367500 & \\
3\times350\times4=\ \ \ 4200 & \\
4^2=\ \ \ \ \ 16 & \\
\overline{371716} & \\
4 & \\
\overline{1486864} & 1486864 \\
\hline
3\times(354)^2=376948 & 23813600 \\
3\times(3540)^2=37694800 & \\
3\times3540\times6=\ \ \ \ 63720 & \\
6^2=\ \ \ \ \ \ \ 36 & \\
\overline{37758556} & \\
6 & \\
\overline{226551336} & 226551336 \\
\hline
 & 11584664
\end{array}$$

(3) $\sqrt[3]{(405\tfrac{28}{125})}=\sqrt[3]{\left(\frac{50653}{125}\right)}$

$=\frac{37}{5}=7\tfrac{2}{5}$;

Since

$$\begin{array}{r|l}
 & 5\dot{0}65\dot{3}\,(37 \\
 & 27 \\
\hline
3\times3^2=27 & 23653 \\
3\times(30)^2=2700 & \\
3\times30\times7=\ \ 630 & \\
7^2=\ \ \ 49 & \\
\overline{3379} & \\
7 & \\
\overline{23653} & 23653 \\
\hline
\end{array}$$

$\sqrt[3]{(7\tfrac{1}{5})}=\sqrt[3]{(7\cdot2)}$; and

$$\begin{array}{r|l}
 & \dot{7}.20\dot{0}00\dot{0}00\dot{0}\,(1\cdot930\ldots \\
 & 1 \\
\hline
3\times1^2=3 & 6200 \\
3\times(10)^2=300 & \\
3\times10\times9=270 & \\
9^2=\ \ 81 & \\
\overline{651} & \\
9 & \\
\overline{5859} & 5859 \\
\hline
3\times(19)^2=1083 & 341000 \\
3\times(190)^2=108300 & \\
3\times190\times3=\ \ \ 1710 & \\
3^2=\ \ \ \ \ \ 9 & \\
\overline{110019} & \\
3 & \\
\overline{330057} & 330057 \\
\hline
3\times(193)^2=111747 & 10943000
\end{array}$$

$$\begin{array}{r|l}
 & \dot{3}\cdot00\dot{4}15\dot{0}00\dot{0}(1\cdot442\ldots \\
 & 1 \\ \hline
3\times1^2=3 & 2004 \\
3\times(10)^2=300 & \\
3\times10\times4=120 & \\
4^2=\ \ 16 & \\ \cline{1-1}
436 & \\
4 & \\ \cline{1-1}
1744 & 1744 \\ \hline
3\times(14)^2=588 & 260150 \\
3\times(140)^2=58800 & \\
3\times140\times4=\ \ 1680 & \\
4^2=\ \ \ \ 16 & \\ \cline{1-1}
60496 & \\
4 & \\ \cline{1-1}
241984 & 241984 \\ \hline
3\times(144)^2=62208 & 18166000 \\
3\times(1440)^2=6220800 & \\
3\times1440\times2=\ \ \ 8640 & \\
2^2=\ \ \ \ \ \ 4 & \\ \cline{1-1}
6229444 & \\
2 & \\ \cline{1-1}
12458888 & 12458888 \\ \hline
 & 5707112
\end{array}$$

(4)

$$\begin{array}{r|r}
 & \cdot00\dot{0}10\dot{0}00\dot{0}(\cdot046\ldots \\
 & 64 \\ \hline
3\times4^2=48 & 36000 \\
3\times(40)^2=4800 & \\
3\times40\times6=\ \ 720 & \\
6^2=\ \ \ 36 & \\ \cline{1-1}
5556 & \\
6 & \\ \cline{1-1}
33336 & 33336 \\ \hline
 & 2664
\end{array}$$

$$\text{Since }\frac{1257\cdot728}{16384}=\frac{157\cdot216}{2048}$$

$$=\frac{19\cdot652}{256}=\frac{4\cdot913}{64};$$

$$\therefore\ \sqrt[3]{\left(\frac{1257\cdot728}{16384}\right)}=\sqrt[3]{\left(\frac{4\cdot913}{64}\right)}$$

$$=\frac{1\cdot7}{4}=\cdot425.$$

4.

$$\begin{array}{r|l}
 & 23\dot{3}\cdot74\dot{4}89\dot{6}\,(6\cdot16 \\
 & 216 \\ \hline
3\times6^2=108 & 17744 \\
3\times(60)^2=10800 & \\
3\times60\times1=\ \ \ 180 & \\
1^2=\ \ \ \ \ 1 & \\ \cline{1-1}
10981 & 10981 \\ \hline
3\times(61)^2=11163 & 6763896 \\
3\times(610)^2=1116300 & \\
3\times610\times6=\ \ 10980 & \\
6^2=\ \ \ \ \ 36 & \\ \cline{1-1}
1127316 & \\
6 & \\ \cline{1-1}
6763896 & 6763896 \\ \hline
\end{array}$$

$$\sqrt[3]{(233\cdot744896\times\cdot008)}$$

$$=6\cdot16\times\cdot2$$

$$=1\cdot232.$$

5. Number of cubic inches in mass $= \dfrac{£10481\ 1s.\ 4d.}{10s.\ 5d.} = \dfrac{2515456}{125} = 20123\cdot648.$

$$\begin{array}{r|l}
 & \dot{2}012\dot{3}\cdot64\dot{8}\ (27\cdot2 \text{ inches} = \text{edge of cube} \\
 & 8 \\ \hline
3\times2^2=12 & 12123 \\
3\times(20)^2=1200 & \\
3\times20\times7=\ \ 420 & \\
7^2=\ \ \underline{49} & \\
\underline{1669} & \\
\underline{7} & \\
11683 & 11683 \\ \hline
3\times(27)^2=2187 & \ \ 440648 \\
3\times(270)^2=218700 & \\
3\times270\times2=\ \ \ 1620 & \\
2^2=\ \ \ \ \ \underline{4} & \\
\underline{220324} & \\
\underline{2} & \\
440648 & \ \ 440648 \\ \hline
\end{array}$$

6.

$$\begin{array}{r|l}
 & \dot{5}065\dot{3}\ (37 \\
 & 27 \\ \hline
3\times3^2=27 & 23653 \\
3\times(30)^2=2700 & \\
3\times30\times7=\ \ 630 & \\
7^2=\ \ \underline{49} & \\
\underline{3379} & \\
\underline{7} & \\
23653 & 23653 \\ \hline
\end{array}$$

$\therefore$ area $= (37\times37)$ sq. ft. $= 1369$ sq. ft.

7. 56 cub. ft. 568 cub. in. $= 97336$ cubic inches.

$$\begin{array}{r|l}
 & 9\dot{7}33\dot{6}\ (46 \text{ inches} = 3 \text{ ft. } 10 \text{ in.} \\
 & 64 \\ \hline
3\times4^2=48 & 33336 \\
3\times(40)^2=4800 & \\
3\times40\times6=\ \ 720 & \\
6^2=\ \ \underline{36} & \\
\underline{5556} & \\
\underline{6} & \\
33336 & 33336 \\ \hline
\end{array}$$

8.

$$\begin{array}{r|l}
 & 2\dot{1}71\dot{7}\cdot63\dot{9}\ (27\cdot9 \text{ feet} \\
 & 8 \\ \hline
3\times2^2=12 & 13717 \\
3\times(20)^2=1200 & \\
3\times20\times7=\ \ 420 & \\
7^2=\ \ \underline{49} & \\
\underline{1669} & \\
\underline{7} & \\
11683 & 11683 \\ \hline
3\times(27)^2=2187 & 2034639 \\
3\times(270)^2=218700 & \\
3\times270\times9=\ \ \ 7290 & \\
9^2=\ \ \ \ \underline{81} & \\
\underline{226071} & \\
\underline{9} & \\
2034639 & 2034639 \\ \hline
\end{array}$$

Therefore, area of floor $=(27\cdot9\times27\cdot9)$ sq. ft. $=778\cdot41$ sq. ft.;

$$\text{therefore, (length of carpet in feet)}\times\frac{21}{12}=778\cdot41;$$

$$\text{therefore, length of carpet in yards}=\frac{778\cdot41\times12}{3\times21};$$

$$\text{therefore, cost of carpet}=\frac{778\cdot41\times12\times42}{3\times21}d.$$

$$=(778\cdot41\times8)d.=£25\ 18s.\ 11\tfrac{7}{25}d.$$

9.

$$\begin{array}{r|l}
 & 94\dot{1}19\dot{2}\ (98\text{ inches} \\
 & 729 \\ \cline{2-2}
3\times9^2=243 & 212192 \\
3\times(90)^2=24300 & \\
3\times90\times8=\ \ 2160 & \\
8^2=\quad\ \ 64 & \\ \cline{1-1}
26524 & \\
8 & \\ \cline{1-1}
212192 & 212192 \\ \cline{2-2}
\end{array}$$

Therefore, area of one side $=(98\times98)$ sq. inches;

therefore, area of 6 sides $=(6\times98\times98)$ sq. inches;

$$\text{therefore, cost required}=\frac{6\times98\times98\times6}{12\times12}d.=2401d.=£10\ 0s.\ 1d.$$

10. 37 cub. ft. 64 cub. in. $=64000$ cub. in.,

and $\sqrt[3]{(64000)}=40$ in.;

therefore, area of 6 sides $=(6\times40\times40)$ sq. in. $=66$ sq. ft. 96 sq. in.

11. Cubic feet in smaller vessel $=8$;

therefore, cubic feet in larger vessel $=24$.

$$\begin{array}{r|l}
 & 2\dot{4}\cdot00\dot{0}\ (2\cdot8\ldots\text{ ft.} \\
 & 8 \\ \cline{2-2}
3\times2^2=12 & 16000 \\
3\times(20)^2=1200 & \\
3\times20\times8=\ \ 480 & \\
8^2=\quad\ 64 & \\ \cline{1-1}
1744 & \\
8 & \\ \cline{1-1}
13952 & 13952 \\ \cline{2-2}
 & 2048
\end{array}$$

12.

$4\dot{3}0\dot{4}6\dot{7}2\dot{1}$ (6561
36
125 | 704
625
1306 | 7967
7836
13121 | 13121
13121

$6\dot{5}6\dot{1}$ (81
64
161 | 161
161

$\cdot 0\dot{0}0\dot{0}0\dot{0}0\dot{0}4\dot{0}9\dot{6}$ (·000064
36
124 | 496
496

$\cdot 0\dot{0}0\dot{0}6\dot{4}$ (·04
64

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